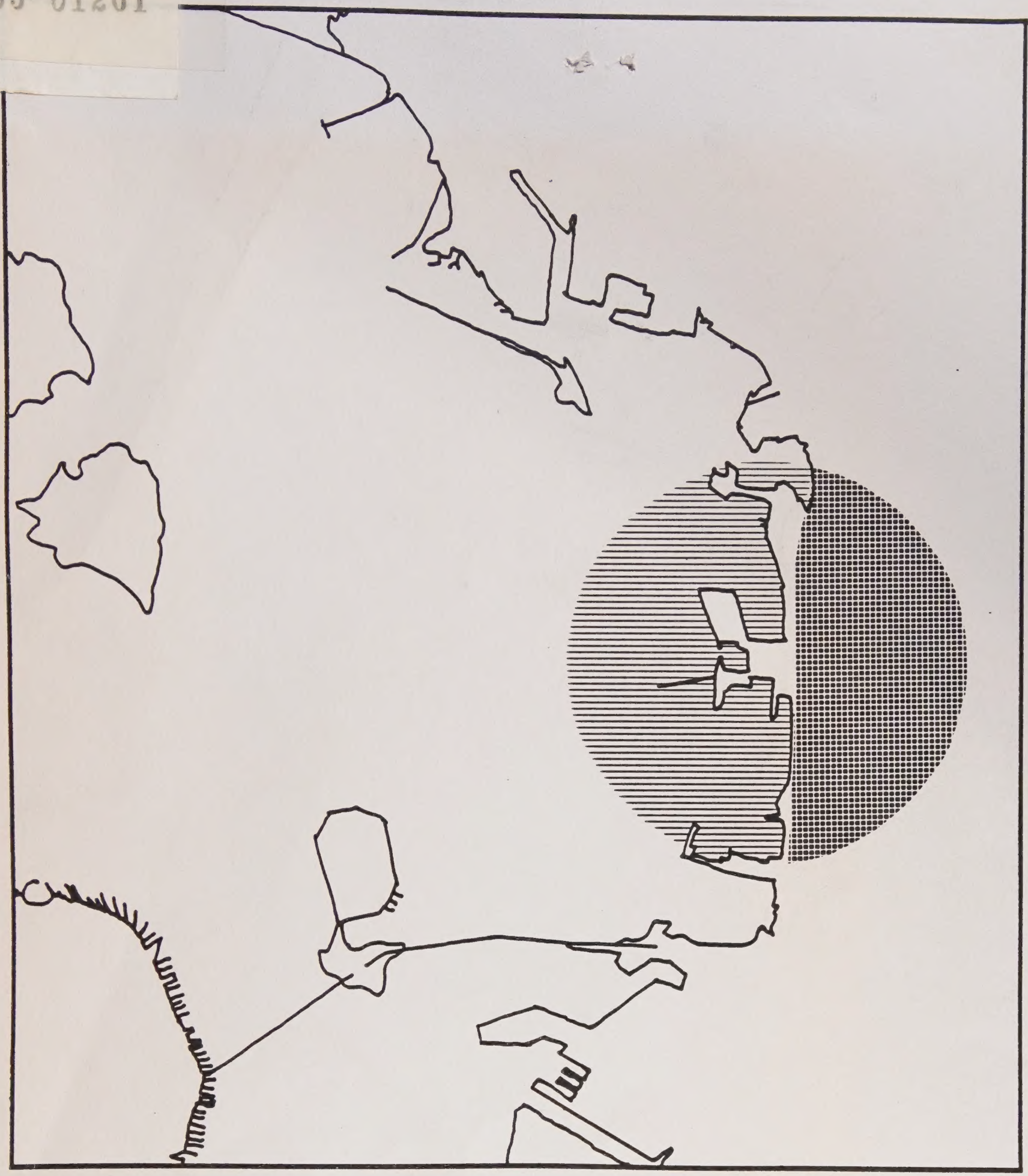

Technical Background Reports for the Berkeley Waterfront

Compiled by Hall Goodhue Haisley and Barker July 1983

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TECHNICAL BACKGROUND REPORTS
FOR THE
BERKELEY WATERFRONT LANDS

July 7, 1983

Prepared for Santa Fe Land Improvement Company

Compiled by Hall Goodhue Haisley and Barker
100 Stevenson Street
San Francisco, California 94105
(415) 543-1212

85 01261

Meteorology Report

Donald Ballanti
Certified Consulting Meteorologist

1424 Scott Street
El Cerrito, Ca. 94530
(415) 234-6087

July 15, 1982

Bryan Grunwald
Hall Goodhue Haisley and Barker
100 Stevenson Street
San Francisco, CA 94105

SUBJECT: Analysis of Climate and Comfort Conditions at Santa Fe Lands in Albany and Berkeley.

Dear Mr. Grunwald:

This letter summarizes my findings concerning climatic conditions at the subject properties, and includes my recommendations on how these climatic conditions should be considered in a later project design. I have attempted to focus on constraints and opportunities present at the site.

Climatic Summary

The climate of the properties is controlled by a persistent marine air flow coming through the Golden Gate. This flow of marine air, sometimes called the "Pacific Monsoon", results from the temperature difference between coastal areas and the interior valley. Winds have been measured at the Berkeley Marina by the California Department of Transportation. A summary of these data is shown in Attachment 1. It shows that westerly winds, from off the Bay, dominate. This is particularly true in spring and summer, when the average wind speed is highest. Southerly winds are more frequent in winter, and are associated with storms and are highly corrolated with rain.

Mean maximum and minimum temperatures for each month are shown in Attachment 2. The moderating effect of the Bay on temperature is evident, as temperatures remain mild all year. It is notable that July and August, normally the warmest months elsewhere, are not the warmest months in Berkeley. This is because the strength of the marine air flow is greatest in these months. The warmest month is September, when the "Pacific Monsoon" subsides.

The area is frequently affected by low clouds and stratus. ttachments 3-6 are diagrams of the frequency of observations with stratus at varying times of the day during the summer months. At 4:30 A.M., the frequency of stratus at Berkeley is 65%. At 10:30 A.M., it is 40%; at 4:30 P.M., 20%, and at 8:30 P.M. it is 40%.

In summary, the project area has a cool, windy climate. Uncomfortably cool and windy conditions are relatively frequent, particularly in the spring and summer.

Human Comfort Factors

The primary impacts of wind in the Berkeley-Albany area are human discomfort, and in extreme cases, human safety. Theoretical and empirical attempts to determine human comfort criteria in a cool climate such as the project's have not yielded a simple criterion. Obviously, variables such as temperature, clothing levels, levels of activity and insolation have to be considered. In the absence of usable thermal comfort criteria, a criterion based on physical effect is often used. Physical effects that cause pedestrian discomfort are wind-blown dust, the blowing of hair and flapping of clothes, and interference with contact lenses. These physical effects all begin to occur at a windspeed of 11 mph.

For inactive people, such as people sitting at dinner, discomfort will occur at a much lower wind level because matabolic heat production is low.

Constraints and Opportunities

The climate of the site does not constrain outdoor uses except for non-active nighttime activities, such as outdoor dining. At night the temperature is normally so low that any perceptable wind will be uncomfortable. (To my knowledge, none of the restaurants in the Berkeley Marina have outdoor dining spaces).

Daytime outdoor dining is appropriate if it can be located in an area sheltered from the wind but still in the sun.

While the climate of the site is not so extreme to limit site uses, care must be taken in the siting, orientation and massing of structures to make sure winds are not increased unnecessarily to the point that outdoor comfort is a problem or usability of facilities is affected.

Recommendations

Site planning should be done with a persistent west wind in mind. A wind strategy for the basic layout of the site should arrange buildings in a north-south alignment, forming interior corridors that are sheltered yet exposed to the south for sunlight. To avoid door problems, main entrances should be on the east or interior side of buildings.

Landscaping should make use of dense, wind-resistant trees and shrubs, as these materials make excellent windbreaks.

A building acts as an obstacle to the wind that distorts the wind field near the structure. Wind approaching a building face is forced down by pressure, and then accelerated around the corner of the building. Ground level winds near the upwind corners of a building typically are stronger than the undisturbed wind. The severity of this wind acceleration depends on

- the presence of upwind structures
- the height of the building
- the volume of wind intercepted by the building face
- the uniformity of the building face.

The potential for wind problems is greatest near tall freestanding, slab-shaped buildings. A number of smaller buildings of similar square footage has a far smaller potential for wind problems.

An ideal situation would involve buildings increasing in height to the east, oriented north-south and roughly forming rows, with numerous setbacks and cut-outs. The areas between buildings should be highly landscaped.

I hope that you find this information useful. I suggest that when project design begins, I be called in to give "over-the-shoulder" advice on site planning. Until then, please do not hesitate to call me if you have questions.

Sincerely,

Donald Ballanti

Donald Ballanti
Certified Consulting Meteorologist

Attachments None included
MB

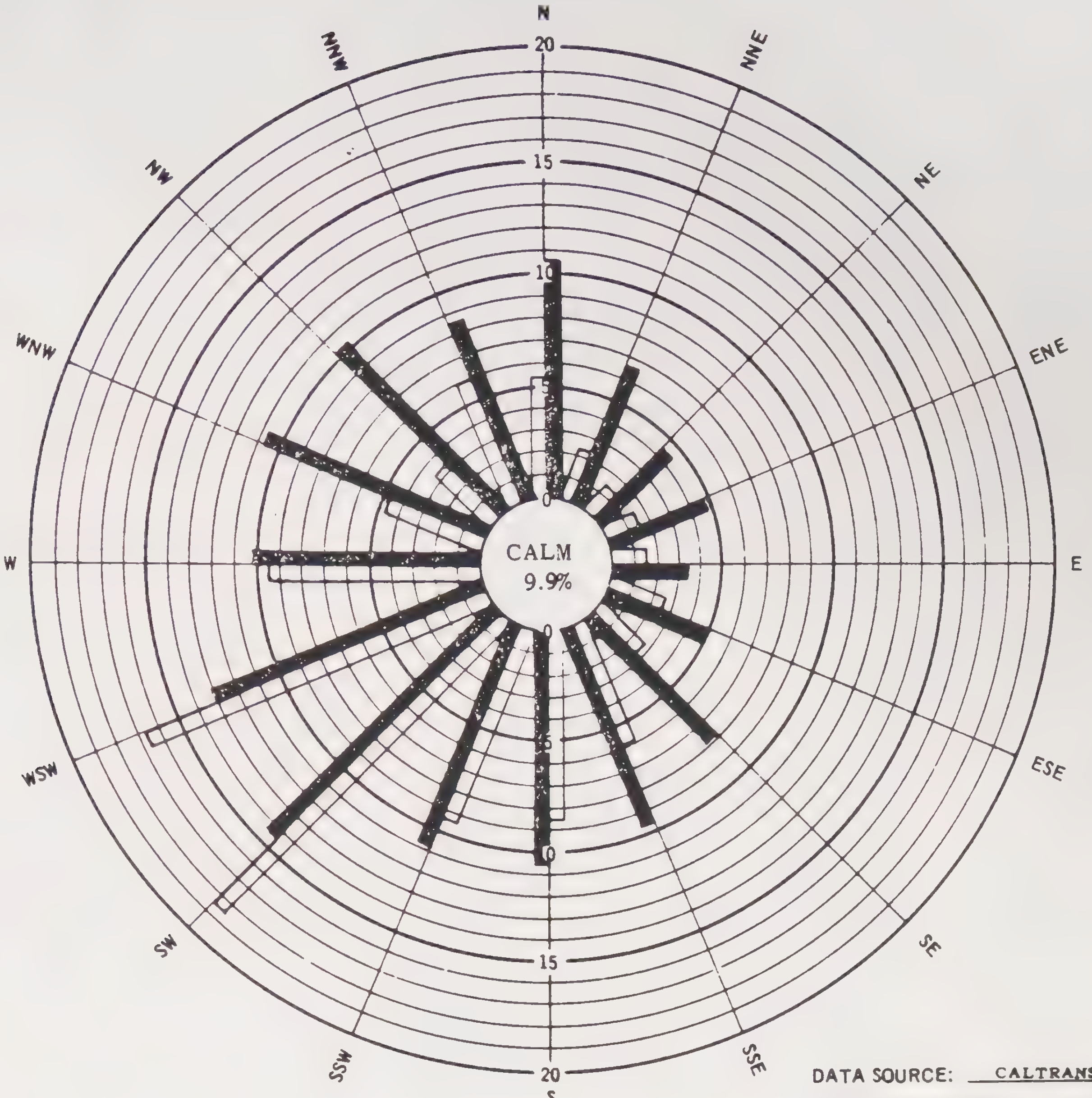
Attachment 1

Berkeley Temperatures

Month	Mean Maximum °F	Mean Minimum °F
January	55.7	43.2
February	59.5	44.6
March	62.0	45.5
April	64.0	47.7
May	67.7	49.9
June	70.6	52.4
July	69.8	53.7
August	69.4	54.1
September	72.3	54.5
October	69.0	52.3
November	63.8	47.9
December	58.0	43.6

Attachment 2

ANNUAL WIND ROSE



DATA SOURCE: CALTRANS

PERIOD OF RECORD: YEAR 1975

TYPE OF OBSERVATION: HOURLY

NUMBER OF OBSERVATIONS: 8,391

HEIGHT ABOVE GROUND (FEET): 32.81

WIND SPEED IN MILES PER HOUR

DIRECTION BY PERCENT

LATITUDE: 37° 52' N

LONGITUDE: 122° 18.7 W

ELEVATION:

PREPARED BY: J. S. DATE: AUGUST 1977

STATION: BERKELEY MARINA CALTRANS SITE 927 ALAMEDA 17

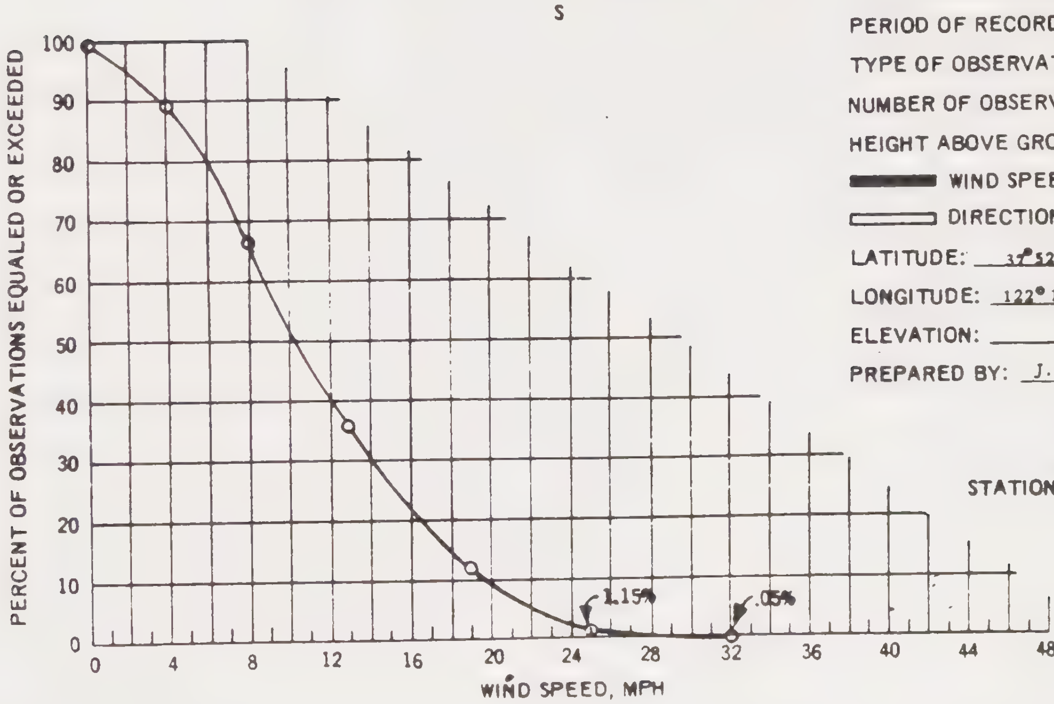
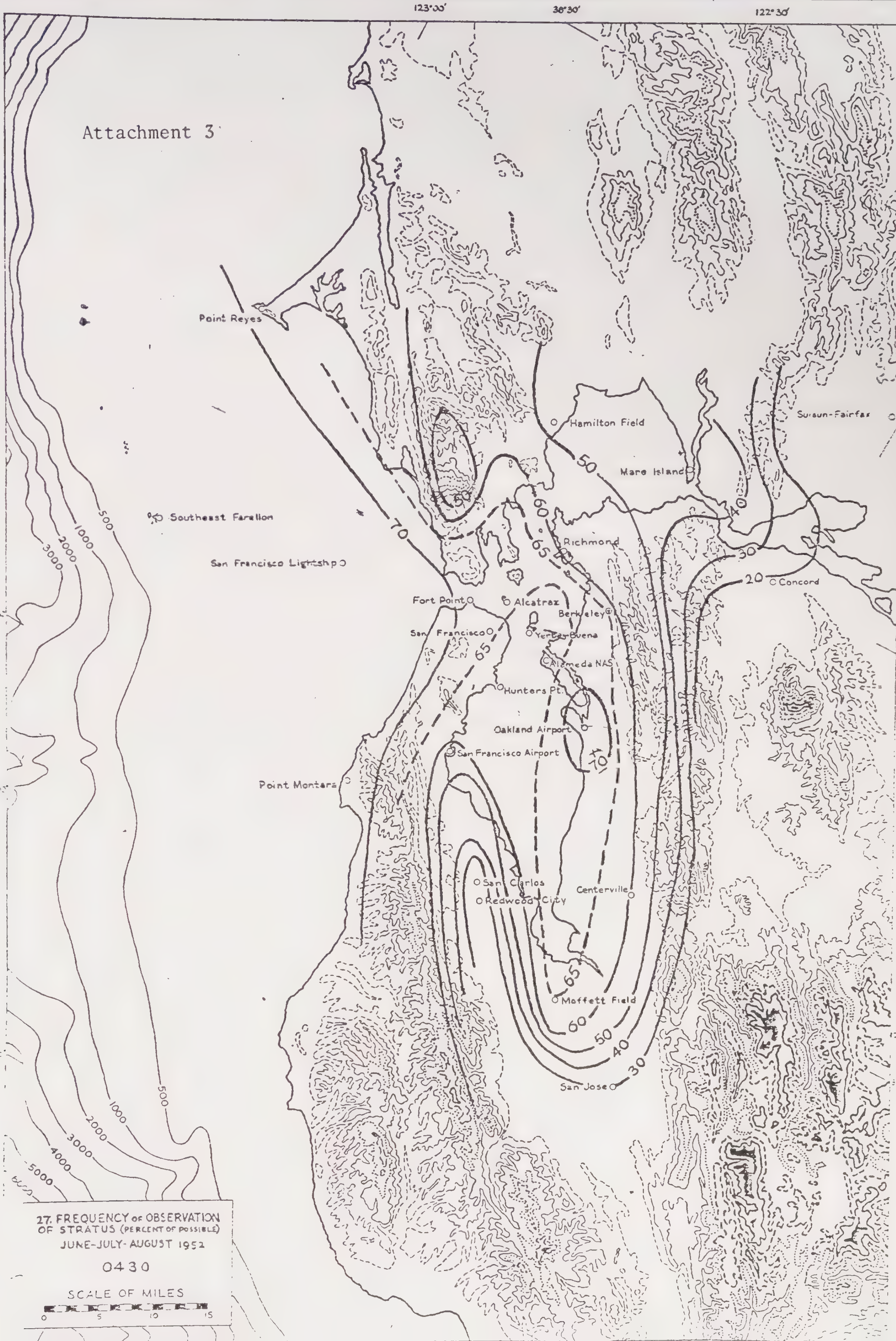


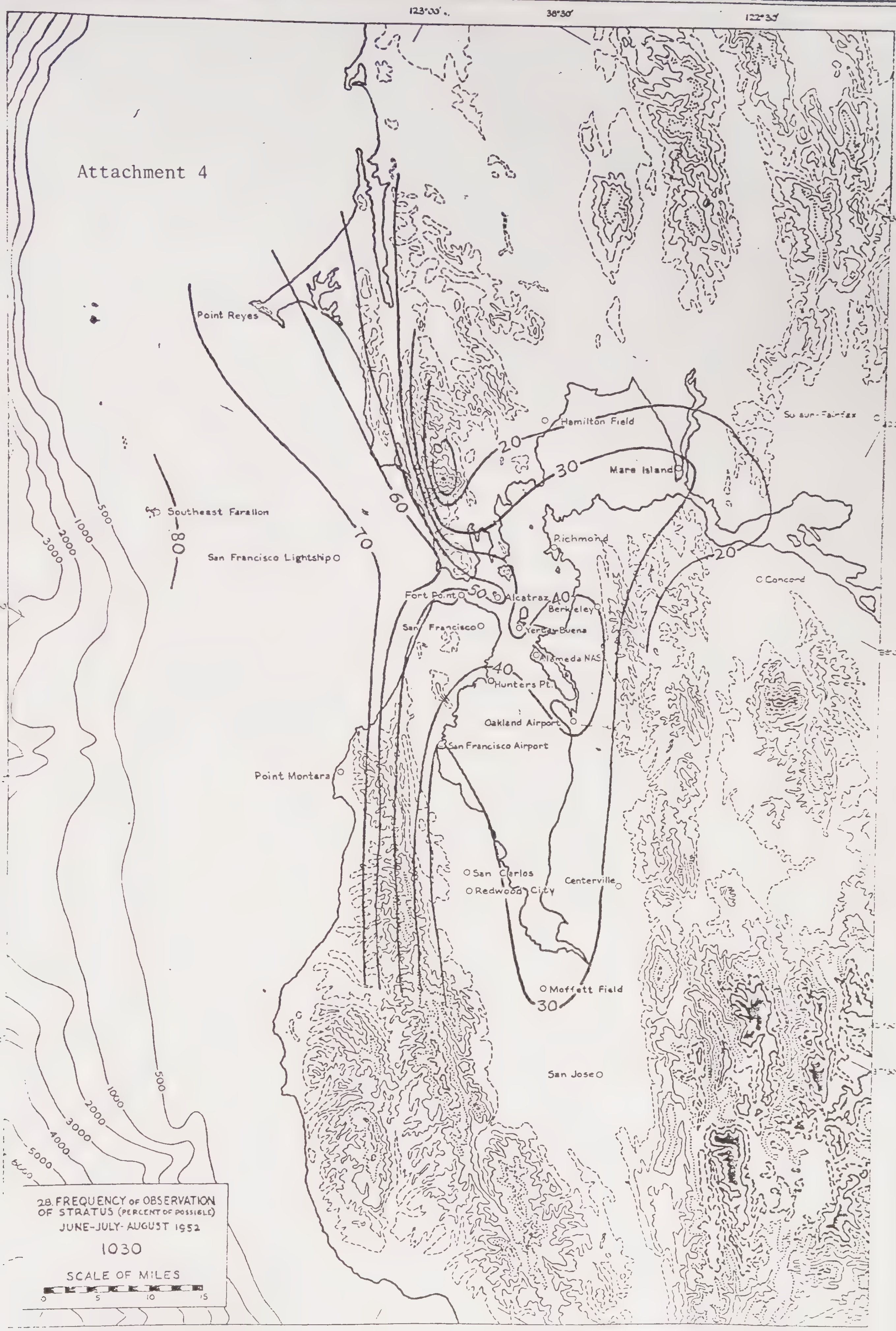
FIGURE 9

Attachment 3



27. FREQUENCY OF OBSERVATION OF STRATUS (PERCENT OF POSSIBLE)
JUNE-JULY-AUGUST 1952
0430
SCALE OF MILES
0 5 10 15

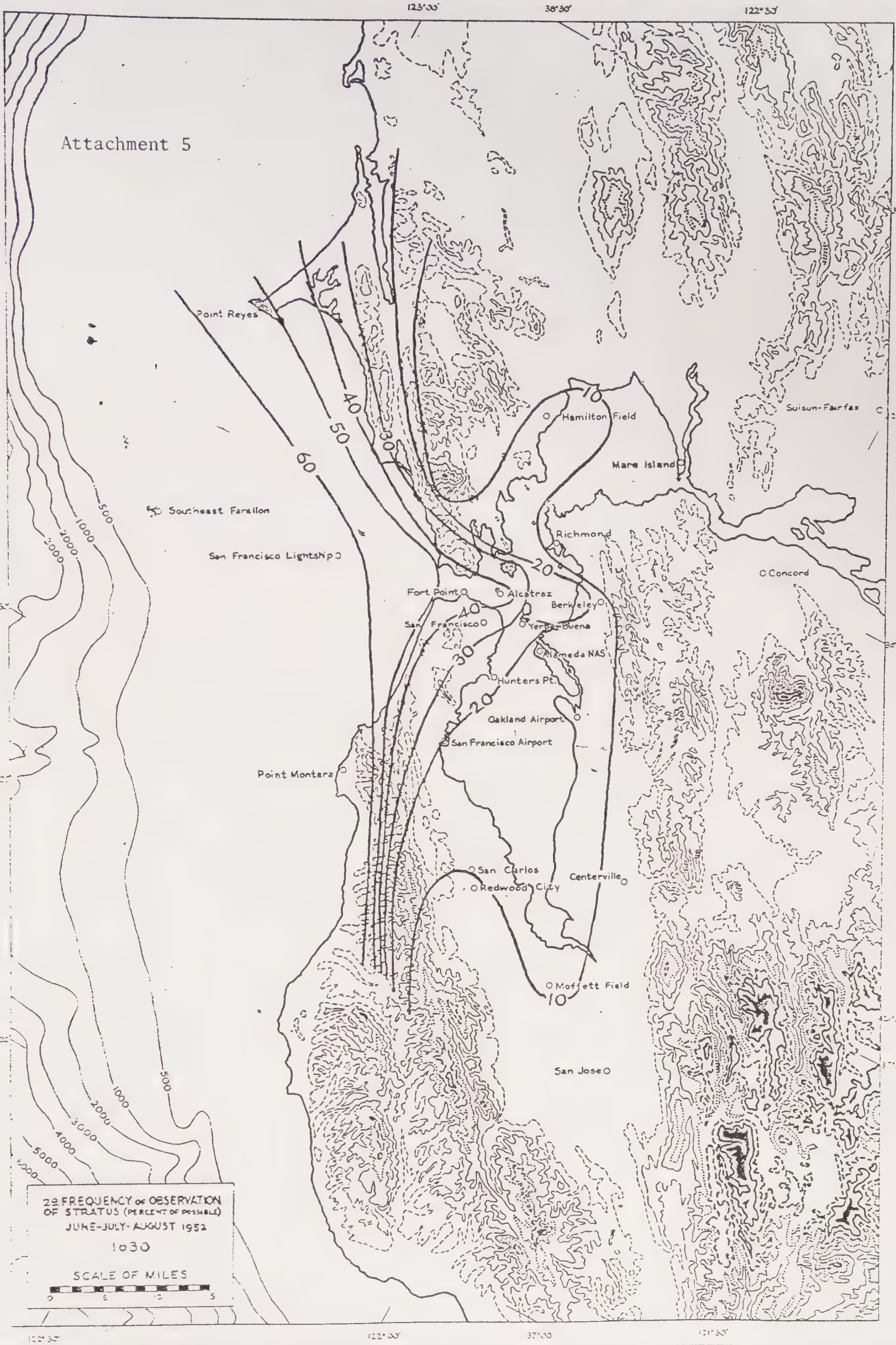
Attachment 4



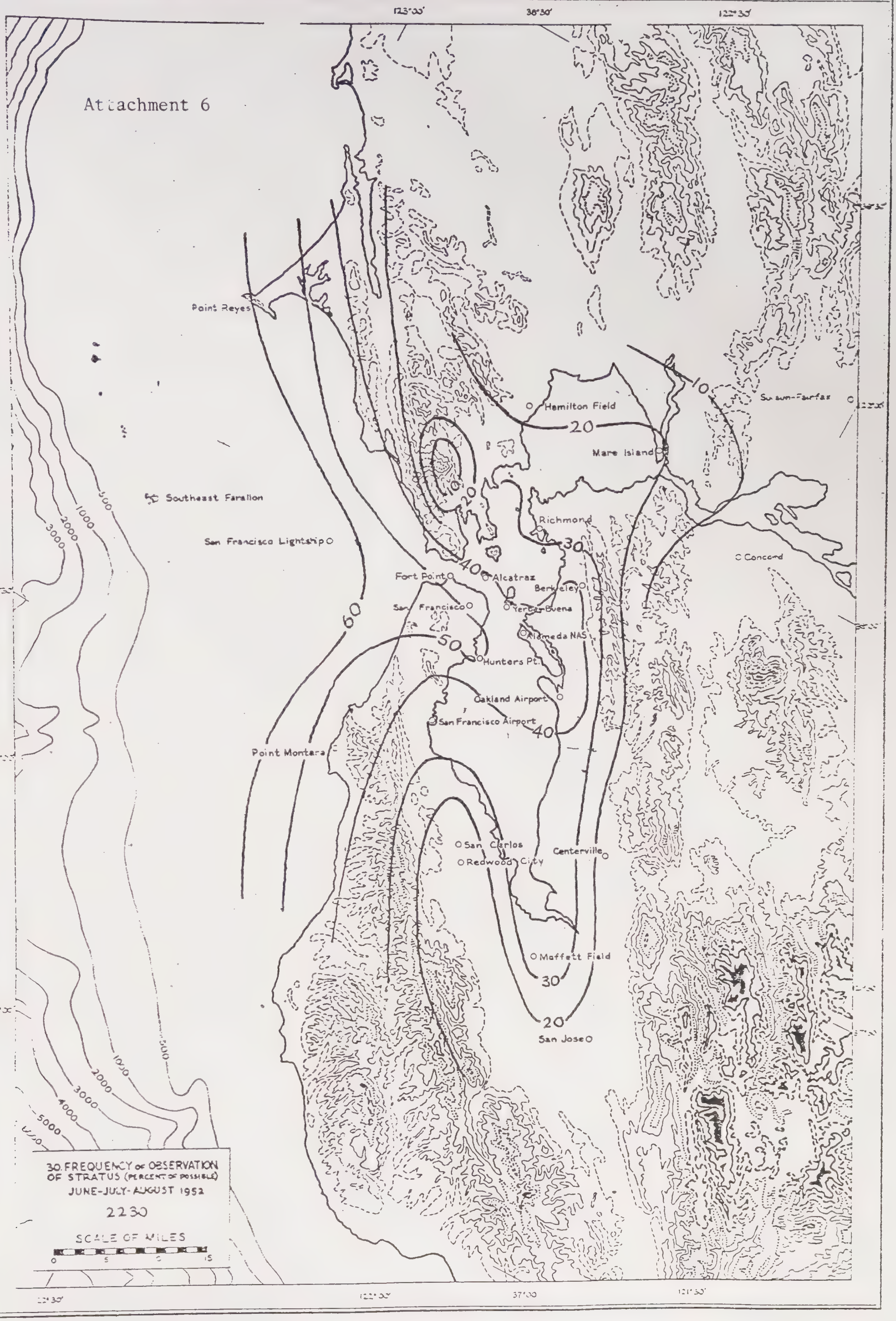
28. FREQUENCY of OBSERVATION OF STRATUS (PERCENT OF POSSIBLE) JUNE-JULY-AUGUST 1952

1030

Attachment 5



Attachment 6



Geotechnical Report

A Report Prepared For

Hall, Goodhue, Haisley and Barker
Architects and Planners
100 Stevenson Street
San Francisco, California 94105

PRELIMINARY GEOTECHNICAL STUDY
SANTA FE LAND IMPROVEMENT COMPANY
BERKELEY WATERFRONT PROJECT
BERKELEY, CALIFORNIA

HLA Job No. 13127,001.04

by

R. William Rudolph

R. William Rudolph
Civil Engineer - 32136

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Stephen R. Korbay
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Harding Lawson Associates
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July 1, 1983

LIST OF ILLUSTRATIONS

I INTRODUCTION

This report presents the results of our preliminary geotechnical study for Santa Fe Land Improvement Company's, Berkeley Waterfront project, Berkeley, California. As shown on the Site Plan, Plate 1, the property is west of Interstate Highway 80 and extends from the Albany City Limits to just south of University Avenue.

A wide variety of development alternatives are being analyzed for the property; including light and multi-story buildings, associated infrastructures and a beach.

The purpose of our study was to compile existing subsurface data in the area to develop 1) maps showing the soil and geologic conditions at the site and 2) preliminary conclusions regarding the impact of these conditions on the project. Items specifically addressed in our study include:

1. Probable foundation types for structures
2. Preliminary estimates of footing bearing pressures and pile lengths for various pile capacities
3. Site settlement and how it will affect the development
4. Geotechnical aspects of site grading
5. Geologic hazards such as liquefaction and ground shaking

6. Methane gas generation and control methods

7. Geotechnical concerns regarding excavation in debris fill areas

8. The effect of surcharging on development schedules

II DATA REVIEW

Our interpretation of the subsurface conditions at the site are primarily based on our review of published and unpublished reports and maps obtained from our files and provided by Santa Fe Land Improvement Company and the City of Berkeley.

In order to 1) supplement existing subsurface information and 2) to obtain accurate ground water levels at the site, we drilled 8 test borings in February 1983. Boring locations are shown on Plate 1. The borings ranged in depth from 10 to 21 feet and extended through the fill materials into the underlying Bay Mud.

During drilling, our engineer logged the borings and obtained samples of the soils encountered. The logs of the borings are presented on Plates 4 through 10. The soils were classified in accordance with the Unified Soil Classification System described on Plate 11. Soil samples were obtained using a Sprague and Henwood (S&H) split barrel sampler. The sampler was driven by a 140 pound hammer with a 30 inch drop. Blow counts required to advance the sampler were converted to standard penetration blow counts and are shown on the boring logs. Samples were visually examined and logged. A perforated plastic pipe surrounded by pea gravel

was installed in Borings 1 through 6, and 8 so that ground water levels could be monitored after drilling.

The locations of test borings drilled in the area are presented on Plate 1.

III GEOLOGY AND SEISMICITY

The site is located within the Coast Ranges Geomorphic province. The region consists of a series of parallel mountain ranges that trend in a northwest direction. San Francisco Bay is a large topographic depression formed by regional folding and faulting. Sandstone and shale bedrock of the Franciscan Assemblage underlies the site at depths of 100 to 200 feet.

The bedrock is overlain by sedimentary deposits of the Temescal Formation which consist of alluvial fan deposits, derived from erosion of the Berkeley Hills to the east. The alluvial fan materials (stiff clays, silts and sands) are overlain by recent bay and marsh deposits. Fill materials have been placed over these deposits.

The site is situated in a seismically active region. Two major active faults in the area are the Hayward and San Andreas fault. The site is situated about 16 miles east of the San Andreas fault and about 2.5 miles west of the Hayward fault. Numerous other less significant active faults exist within about 100 miles of the site. The greatest earthquake experienced in historic times in the region occurred on April 18, 1906. It was estimated to have a Richter magnitude 8+ and occurred on the San Andreas fault. The Hayward fault has

produced two major earthquakes of about magnitude 7.0 which occurred in June 10, 1836 and October 21, 1868.

Because of the proximity to the site, the Hayward fault probably represents the most severe earthquake source, although a major earthquake on the San Andreas fault would probably be almost as severe.

The recurrence interval for an earthquake on the San Andreas fault with a magnitude of 8.3 ranges from 100 to 1000 years (Borcherdt, 1975). On the Hayward fault, a maximum earthquake with a magnitude between 7.0 and 7.5 may recur at 50 - 100 year intervals. Earthquakes of smaller magnitudes will occur more frequently on all the major faults.

IV SITE AND SOIL CONDITIONS

The project site can be divided into four areas, each having different soil conditions which will affect development. These areas, designated as A through D, are described in the following sections and are shown on Plate 2. For planning, we have developed several plates showing the soil conditions at the site. Plate 1 presents the locations of existing test borings and Bay Mud thicknesses. Plate 3 shows the elevation of the top of firm soils throughout the area and the limits of the original marsh land.

A. Area A

Area A is a landfill regulated by the City of Berkeley. It covers approximately 80 acres and is the most recent, in terms of fill placement, of the landfill areas. In the mid-1960's, the area was isolated from the San Francisco Bay by soil, rock and concrete rubble perimeter dikes. Since that time, this area has received refuse fill. The refuse has been placed and compacted in cells, each surrounded by compacted soil.

The refuse fill varies in thickness from about 20 to 60 feet. The refuse fill is typically covered with at least 2 feet of soil. The fill is underlain by soft, compressible clayey silts known as Bay Mud. Bay Mud thicknesses range

from about 40 to 60 feet. Along the east side of the site in the area to be developed, the fill is typically 20 feet thick and is underlain by 35 to 45 feet of Bay Mud. The Bay Mud is underlain by stiff sandy and silty clays and dense sands.

B. Area B

Area B is a 72-acre refuse landfill area. The refuse fill is underlain by Bay Mud. Available data indicate that landfill operations were primarily conducted between the early 1940's and 1962. During this period, portions of the property were diked off into sections by levees. The entrapped water was pumped out and the resulting area filled with refuse. A variable thickness of relatively clean soil was placed over the refuse. Our test borings encountered clayey cover materals ranging from about 3 to 10 feet thick. It is unknown whether the refuse was compacted during placement.

The refuse is composed of residential, commercial and construction debris wastes. Our test borings encountered a mixture of materials including metals, glass, paint, concrete, wood tires, and other organic materials in various stages of decomposition. The refuse was typically mixed with clayey soils. References indicate that some areas of refuse were incinerated prior to placement. The total fill (refuse

and soil cover) thickness ranges from about 8 to 27 feet; the Bay Mud underlying the landfill ranges in thickness from 4 to 40 feet, being thickest near the northwest corner of the area. Stiff silty and sandy clays and dense sands underlie the Bay Mud. The ground surface elevation ranges from +9 to +15 feet and averages approximately +10 feet (MLLW Datum).

Ground water was encountered in our test borings 1.5 to 2 feet below existing grades. Water levels were measured after an extremely wet winter season, which probably accounts for these high water levels. At other times of the year or during years of normal rainfall, we would expect water levels to be lower. Surface infiltration is probably great since there is no positive drainage off the site. Surface water typically creates large ponds.

C. <u>Area C</u>

Most of Area C is a reclaimed tidal marsh area. Specific information regarding the fill is not presently available. However, it appears that much of the fill was placed prior to 1946. Filling in certain areas continued until about 1953. We understand that much of the refuse was incinerated prior to placement. Test Borings 5, 6, and 7 were drilled in this area and encountered black clayey fill materials which contained abundant quantities of brick, glass

and metal fragments. These clayey soils were weak and judged to be moderately compressible. Very little organic material (wood, paper, etc.) was encountered. The fact that much of the material was incinerated probably accounts for the soil color and the absence of organic material. The area north of Gilman Street was used as a storage facility for military equipment during World War II.

Based on available test boring and topographic information, it is estimated that the fill layer is about 10 to 15 feet thick. The thickness of the Bay Mud beneath the fill ranges from about 3 to 25 feet, averaging 5 to 10 feet over much of the area. The thicker mud areas are located south of Gilman Street. As in the other zones, stiffer clays and dense sands generally underlie the Bay Mud layer. In Test Boring 7 in the northern end of Area C, loose sands were encountered in the Bay Mud. This sand is probably a discontinuous lens within the mud.

Ground water was encountered in the borings drilled in Area C. Water depths ranged from about 1.5 to 5 feet below existing grades. Water depths are probably uncharacteristically high for the reasons previously discussed.

D. Area D

Unlike the other three areas, Area D has not been utilized as a refuse landfill area. The fill is largely a heterogenous mixture of concrete and brick rubble and clayey soils. The zone was a submerged portion of the bay. The area was primarily filled during the 1950's.

The thickness of the fill is about 20 feet in the westerly portion and it is estimated to vary little over the remainder of the site. The fill is underlain by a relatively thin layer of Bay Mud ranging from about 3 to 7 feet thick. Stiff soils underlie the Bay Mud.

V GEOLOGIC HAZARDS

Presented in this section is a brief discussion of geologic hazards which could affect the Berkeley Waterfront Project site. Where appropriate, some geologic hazards are further discussed in subsequent sections of this report as they pertain to specific areas.

A. Seismic Shaking

Seismic activity in the area will generate ground shaking at the site during the anticipated life of the development. Consequently, all structures should be designed to account for the lateral loads imposed on them during seismic shaking. In addition, seismic shaking may cause surface cracking of the fills.

B. Liquefaction

Liquefaction is a phenomenon which typically occurs in loose, saturated cohesionless soils (i.e., sands and coarse silts) during earthquake shaking. During liquefaction, the soil suddenly loses strength. Significant building settlement could occur where foundations are supported on liquefiable materials. Liquefaction occuring in sandy soils situated well below the ground surface, typically results in surface settlement. The magnitude of surface settlement will

depend primarily on the thickness and characteristics of the sandy soils.

In general, the soils encountered at the Berkeley Waterfront project site are judged not susceptible to liquefaction because they are typically clayey materials. However, isolated lenses of relatively loose sandy soils do exist in the Bay Mud sediments which are probably susceptible to liquefaction. These sandy soils are generally not continuous and typically exist well below grade, and hence, the effects of liquefaction on surface structures should be minor. In this case, liquefaction will likely be characterized by relatively minor ground surface settlement.

C. Slope Stability

Although detailed slope stability analyses have not been performed, we judge that the factor of safety of the perimeter slopes against slope failure are adequate under static conditions. Seismic shaking will reduce existing factors of safety. Based on our experience, we judge that during seismic shaking, factors of safety will drop to around unity and some deformation of the slopes will occur. The actual magnitude of these deformations is difficult to estimate since they depend on many factors which are unknown at this time. Slope movements will probably be characterized

by settlement of the ground surface and lateral movements of the slope (lurching) toward the bay. Cracks will likely develop in the ground behind the crest of the slope. For this reason, it would be prudent to establish setbacks from the dikes for all structures. Appropriate setback distances will vary depending on soil conditions.

D. Settlement

Ground surface settlement is presently occurring due to 1) consolidation of the bay mud under fill loads and 2) decomposition of the refuse fills. This settlement will cause buildings supported on shallow foundations on the fill to settle differentially. All structures should be designed to minimize the effects of settlement. This can be done by using foundations which develop support below the Bay Mud (piles) or for relatively light structures which can tolerate some differential settlement, by using a relatively rigid mat or grid type shallow foundation.

E. Flooding

The site is in a relatively low lying area adjacent to the San Francisco Bay. Site grades vary from about +7 to +15 feet (MLLW datum). Site grades are judged adequate to

protect the area from anticipated 100 year design floods*. However, the area could be inundated by seismically induced ocean waves (tsunamis) entering the bay through the Golden Gate Bridge channel.

Based on a report by the U.S. Corps of Engineers** a probable maximum tsunami wave about 12.2 feet above mean lower low water level will occur at 100 year intervals. This wave height does not account for wave attenuation due to the leading edge of the Berkeley Marine at North Waterfront Park. Since most of the site is above this elevation, the likelihood of major inundation due to a tsunami is remote. The inundation risk to the low area could be reduced by raising levee heights and at appropriate locations.

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* James R. Houston and Andrew W. Garcia, "Type 16 Flood Insurance Study: Tsunami Predictions for the West Coast of the Continental United States", Technical Report H-78-26, prepared for Federal Insurance Administration, Department of Housing and Urban Development (Vicksburg: Hydraulics Laboratory, 1978), 32-33.

** Andrew W. Garcia and James R. Houston, "Type 16 Flood Insurance Study: Tsunami Predictions for Monterey and San Francisco Bays and Puget Sound", Technical Report H-75-17, prepared for Federal Insurance Administration, Department of Housing and Urban Development (Vicksburg: Hydraulics Laboratory, 1975) 8-9.

VI DISCUSSION AND PRELIMINARY CONCLUSIONS

A. Area A

We understand that the eastern portion of Area A may be used as a park including at-grade parking lot and small, one-story structures to service the park and beach. As previously discussed, this area is underlain by relatively recent refuse fills surronded by a rubble perimeter dike. The site is currently settling and will continue to do so as a result of consolidation of the Bay Mud and compression and decomposition of the garbage fill. Significant differential settlements will occur due to variations in the refuse fill materials and decomposition rates. Settlement on the order of several feet will probably occur in the refuse area. Relatively large differential settlements will also occur between the areas underlain by the refuse fill and the perimeter dikes.

Sufficient soil fill probably exists over the debris to support pavements. A significant amount of grading will likely be required to develop the area. However, grading may expose refuse fill in some areas. In this case, portions of the refuse would have to be overexcavated and replaced with properly compacted soil fill.

Because significant total and differential settlements are anticipated, gravity flow pipe lines, such as storm drains and sanitary sewers, and overall site drainage patterns should be designed with exaggerated gradients. Differential settlement could cause the pavements to deteriorate rather rapidly as compared to areas where stable subgrade conditions exist. As a result, relatively frequent pavement and utility maintenance will likely be required in this area.

B. Area B

We understand that it may be necessary to place additional fill on the site for drainage purposes. Significant total and differential settlements are anticipated as a result of this new fill and from ongoing decomposition of the refuse fill. As a result, we believe that most structures in the area will require pile foundations.

Methane gas resulting from decomposition of the refuse may be present, particularly in the most recent fill refuse areas. This gas can accumulate in enclosed areas and possibly create health and fire hazards. Control of methane

gas will likely be a consideration in the design of most structures in the area.

1. Settlement

Significant settlements have occurred in Area B since initial filling. Settlement has occurred due to compression of the Bay Mud and refuse fill due to the weight of the refuse and capping materials. A large amount of settlement has also occurred due to decomposition of the organic portions of the refuse fill.

We judge that much of the settlement due to existing loads has already occurred. However, the area will likely continue to settle as decomposition continues. Settlement as great as 1 foot may ultimately occur. Significant differential settlements will probably result as decomposition proceeds.

Additional settlement will occur due to new fill and/or building loads. We estimate that for every foot of new fill placed approximately 2 to 4 inches of additional settlement will ultimately occur due to compression of the Bay Mud and up to several inches of additional settlement will occur due to compression the refuse fill. The magnitude settlement within the refuse fill is difficult to predict and will vary greatly. Compression of the fill will however, occur rapidly as loads are applied. Settlement records are

available for the Marriott Hotel Complex near the northwest corner of Area B which substantiate our settlement estimates. Details regarding the hotel are discussed in a subsequent section of this report.

Because the Bay Mud and is relatively thin, most compression settlement will occur relatively rapidly after new fill placement. A major portion of this settlement will probably be complete within 1 to 2 years of fill placement. As a consequence, the placement of new fill as far in advance of site development as possible will allow a portion of settlement to occur before structures, utilities, and pavements are constructed. Surcharging would be an effective means of accelerating compression settlement, thus would reduce post-construction settlement. It would not substantially reduce post-construction settlement due to decomposition. Settlement due to decomposition will continue to occur at a slow rate for many years.

With respect to surcharge filling, much of the post-construction refuse fill compression settlement can be reduced by placing about 5 feet of surcharge fill 6 months to 1 year prior to site development. Surcharging to reduce Bay

Mud settlement will take longer and will depend on the Bay Mud thickness. We judge that surcharging periods of 1 to 2 years will be appropriate to significantly reduce Bay Mud settlement. The longer periods will be necessary where the Bay Mud is thickest.

Settlement within Area B will affect pavements and utilities similar to that in Area A. As a result, gravity flow pipeline gradients should be exaggerated. In addition, pavements will deteriorate fairly rapidly and will require frequent maintenance.

2. Foundations

a. Pile Foundations

Pile foundations will probably be necessary for most structures constructed at the site. Moderate capacity, prestressed, precast concrete piles deriving support from skin friction in the firm soils underlying the Bay Mud will probably be most appropriate. We judge that in order to support an allowable dead plus live load of 90 to 100 tons, 12-inch-square piles would have to penetrate 50 to 60 feet into the firm soils below the Bay Mud. The estimated elevation of the top of the firm soils is presented on Plate 3. Settlement of the fill surrounding the piles will impose downdrag loads on them. Downdrag loads of 10 to 20

tons will need to be added to structural loads when evaluating the capacities of individual piles. On this basis, we estimate that 12-inch-square, prestressed concrete piles supporting about 80 tons of structural load will need to be 75 to 110 feet long. The shorter piles will probably be appropriate for the area nearest the University Avenue overpass. Pile lengths will become progressively longer toward the northwest portion of the site.

A major concern associated with supporting structures on pile foundations is that significant differential movement will occur between the pile supported structures and the surrounding areas. This differential settlement must be considered in 1) the design of utilities where they enter and exit the buildings, and 2) entrances to the buildings. Settlement will also reduce the area available to provide resistance to lateral forces.

b. Shallow Foundations

Continuous grids of structurally reinforced spread footings or mats can probably be used to support relatively light structures in the area providing some differential settlement is acceptable. The footings or mats should be underlain by several feet of properly compacted soil. Structures supported on spread footings should be

relatively settlement tolerant and should be designed with structurally supported floors if practical, and provisions for releveling if significant differential settlement occurs.

Shallow foundations constructed as described above can probably be designed using bearing values in the range of those shown in the following table.

Probable Range of Bearing Values

Load Condition	Range of Bearing Values (psf)
Dead load	2000 to 3000
Dead plus live load	2400 to 3600
Total load, including wind and seismic	3000 to 4500

Presented below is a brief summary of soil conditions and settlement characteristics for the Marriott Hotel Complex. It is included to provide a clear understanding of the settlement concerns typical of construction on refuse landfills.

> The Mariott Hotel Complex is located west of Marina Boulevard near the northwest corner of Area B. It is one of the few nearby structures constructed over soil conditions similar to those in Area B. The soil conditions at the site were investigated in 1970 by others. The borings drilled at the Mariott site encountered 12 to 25 feet of fill overlying 3 to 19 feet of soft Bay Mud. The Bay Mud is underlain by stiff clays which were encountered at elevations varying between -20 and -26 feet.

The fill consisted of a thin surface layer of sandy and gravelly clay placed over wood, concrete, metal and household garbage mixed with sandy and clayey soils. In general, the fills on the north side of the site contained more refuse. The variable thickness of Bay Mud probably indicates that the mud was displaced during fill placement causing mud waves.

The complex consists of 3, 3-story hotel structures, a single story restaurant structure and an administrative building. Each of these structures is supported on a shallow foundation. Foundation preparation consisted of excavating 5 feet of fill below the structures and replacing it with properly compacted fill. The structures are supported by mat foundations, stiffened by grade beams. This type of foundation lends itself well to relatively short span structures which do not have large concentrated structural loads.

Significant settlement of the structures were anticipated. Detailed settlement measurements were recorded between May 1971 and January 1973. During this time period, total settlements as great as 14 inches and differential settlements as great as 6 inches in 50 to 60 feet were recorded. Although we have not reviewed more recent settlement records, we understand that the buildings have now settled as much as 20 inches with differential settlements as great as 8 inches in 50 to 60 feet. Floors within the buildings slope significantly and building walls lean noticeably.

3. Methane Gas

a. Generation

Landfill gases generated during the biological decomposition of organic refuse consists primarily of methane and carbon dioxide. Methane usually represents 50 to 75 percent of the gas composition. It is produced under anaerobic conditions and typically is generated for 20 to 30

years. It is odorless, colorless and can be explosive if ignited in concentrations of 5 to 15 percent by volume in air. Methane is lighter than air and tends to migrate vertically unless the refuse fill has an impervious cap which will cause the gas to migrate horizontally.

b. Gas Control

Within the study area, the older refuse fill probably has ceased producing methane. However, in some of the newer fills, methane may still be generating in small amounts. The only way to be certain if methane is present is to perform field tests, especially in the area where development will involve structures. If methane is discovered, it will be necessary to determine if a passive or active venting system will be necessary. Passive systems generally involve collecting and/or venting the gas using its natural migration characteristics to remove the gas from the refuse. Active systems generally involve mechanical assistance in a collection and/or venting system by connecting a passive system to a vacuum pump.

Active and/or passive systems can be used to reduce the methane problem for a large area or individual buildings. Areal collection requires a system of gravel-filled trenches with perforated pipes vented to the surface.

Attaching the vents to a manifold system and vacuum pump would increase the collection capabilities of the system. Similar collection and venting systems are used around and/or under structures. Generally, active systems (i.e., using vacuum pumps) are recommended for most structures; however, for some low-rise buildings, a passive system may be sufficient.

Alarm systems are available for detecting the presence of methane in structures and are frequently used, especially when the structures have basements.

The design of a passive or active gas venting system depends upon the site conditions and the use of the building. Several different systems or combinations of systems could be used for a large development.

4. <u>Large Excavation of the Refuse Fill</u>

Large and deep refuse fill excavations generally pose significant odor problems because they expose large areas where odors can be released. Older refuse fills contain contaminated liquids (leachate). The excavated refuse will have to be transferred to an operating landfill, probably in specialized trucks to prevent the leachate in the fill from spilling onto the ground. During excavation, it will be necessary to prevent fill leachate from contaminating

the bay water or ground water during and after construction. Leachate from the excavation may have to be treated, confined and/or removed.

C. Area C

Most of Area C is currently above the minimum site elevation of about +11.5 feet. As a result, we conclude that much of the site can be developed with minimal grading. Since the existing fill was placed prior to 1940 and the Bay Mud in the area is generally thin, most site settlement under existing loads has already occurred.

Where site grades do not need to be raised, relatively light structures (i.e., 1- to 2-story) probably can be supported on shallow foundations providing they can tolerate some differential settlement.

Moderately to heavily loaded structures within this area will require pile foundations similar to those described in Area B. Estimated settlements and probable foundations in Area C are discussed in the following sections.

1. Settlement

As in Area B, new fill and/or structures supported on shallow foundations will cause additional site settlement. Settlement magnitudes will probably be less in this area because the existing fill has been in place longer

and is probably less compressible than in Area B. In addition, the Bay Mud is thinner in Area C than in Area B.

We estimate that about 1 to 2 inches of additional settlement will occur for each foot of new fill placed due to compression of the Bay Mud. Settlement within the refuse fill should be relatively small since it is apparent that most organic material has been incinerated prior to placement.

Settlement due to the weight of new structures supported on shallow foundations will be roughly proportional to structural loads. Moderately loaded foundations could experience settlement on the order of several inches. Post construction settlement could be significantly reduced by surcharging building locations six months to one year in advance of construction using 5 to 10 feet of excess fill.

2. Foundations

a. Shallow Foundations

Continuous grids of structurally reinforced spread footings or mats can probably be used to support relatively light structures (1 to 2 stories) providing some differential settlement is acceptable. Details regarding appropriate design values are the same as those discussed for Area B.

b. Pile Foundations

Structures greater than 2 stories in height will probably require pile foundations. Prestressed, precast concrete piles similar to those discussed for Area B, will probably be appropriate. However, where no new fill is placed, downdrag loads need not be considered in pile design. Twelve-inch-square, concrete piles, 55 to 85 feet long will probably be necessary to support structural loads of 90 to 100 tons, dead plus live loads.

c. Methane Gas

Because the fills in Area C are over 40 years old, it is unlikely that they are still generating significant quantities of methane gas. As a consequence, a methane gas collection system will probably not be required in this area. This should be confirmed prior to final design.

D. Area D

Area D is also above the minimum elevation of +11.5 feet. Conditions in this area are similar to those in Area C, although the fill is thicker and probably does not contain significant quantities of organic refuse. Similar to Area C, the fill has been in place long enough that settlement under existing loads is probably complete. As a result, light to moderate structures (i.e., 1- to 3-stories)

can probably be supported on shallow foundations. Heavier structures (i.e., 3-stories or greater) probably will require pile foundations.

Because the Bay Mud beneath Area D is relatively thin and the fill is believed to have a relatively low compressibility, settlement resulting from new fill or moderately heavy structures supported on shallow foundations will be comparatively small. We judge that surcharging will not be cost effective in this area. Shallow and pile foundations similar to those discussed for Area C will likely be appropriate in this area.

E. Fill Construction in Submerged Areas

We understand that filling within the bay is maybe considered for beach or other public open space/recreation purposes. From a geotechnical standpoint, we believe that this is feasible. However, we believe that significant permitting obstacles will have to be overcome.

In general, two basic procedures can be used to fill submerged portions of the bay. The first simply consists of dumping soils from land sources into the areas to be filled. Once the fill extends above water, the fill materials can be spread and properly compacted. Another commonly used method of filling in the Bay Area involves constructing perimeter

containment dikes and filling the interior of the diked area with dredged soil. Typically, within the bay, two types of soil are commonly encountered. They are Bay Mud and relatively clean sand from selected borrow areas. Bay Mud, where placed as a dredged slurry, is an extremely weak and compressible material which takes many years to dry out. Frequently, a layer of clean sand is placed over the dredged Bay Mud to create a surface that is more serviceable. Fill loads will cause the underlying naturally deposited Bay Mud to consolidate resulting in settlement of the ground surface. Surface elevations should account for future settlement.

Perimeter dikes and fill slopes would have to be relatively flat because of the weak underlying soil (Bay Mud). We judge that slopes on the order of 4:1 to 5:1 (horizontal:vertical) will be appropriate. In addition, containment dikes should be specially designed to limit the migration of retained soil through the dike.

F. Roadways

Based on our study, we conclude that most of the site is covered with at least several feet of clay soils containing little or no refuse. In general, we believe that the existing surface soils will provide suitable subgrade support

for flexible pavements. However, we judge that it will be necessary to properly compact the upper 12 inches of the surface soils beneath pavement to establish uniform support. Undoubtedly, some unstable areas will be encountered during road and parking area construction. Localized unstable areas can probably be stabilized by removing 2 to 3 feet of the soft soils and replacing it with properly compacted select fill. Since most of the existing surface soils are moderately to highly plastic, they probably have relatively low resistance values (R-value). In general, we judge that most of the surface soils at the site will have an R-value of about 5.

As a guide in planning, we have developed pavement sections using Cal Trans design procedures for various traffic indexes (TI). Although specific traffic studies have not been done, the following table summarizes approximate ranges of traffic indexes that we judge appropriate for various pavement requirements.

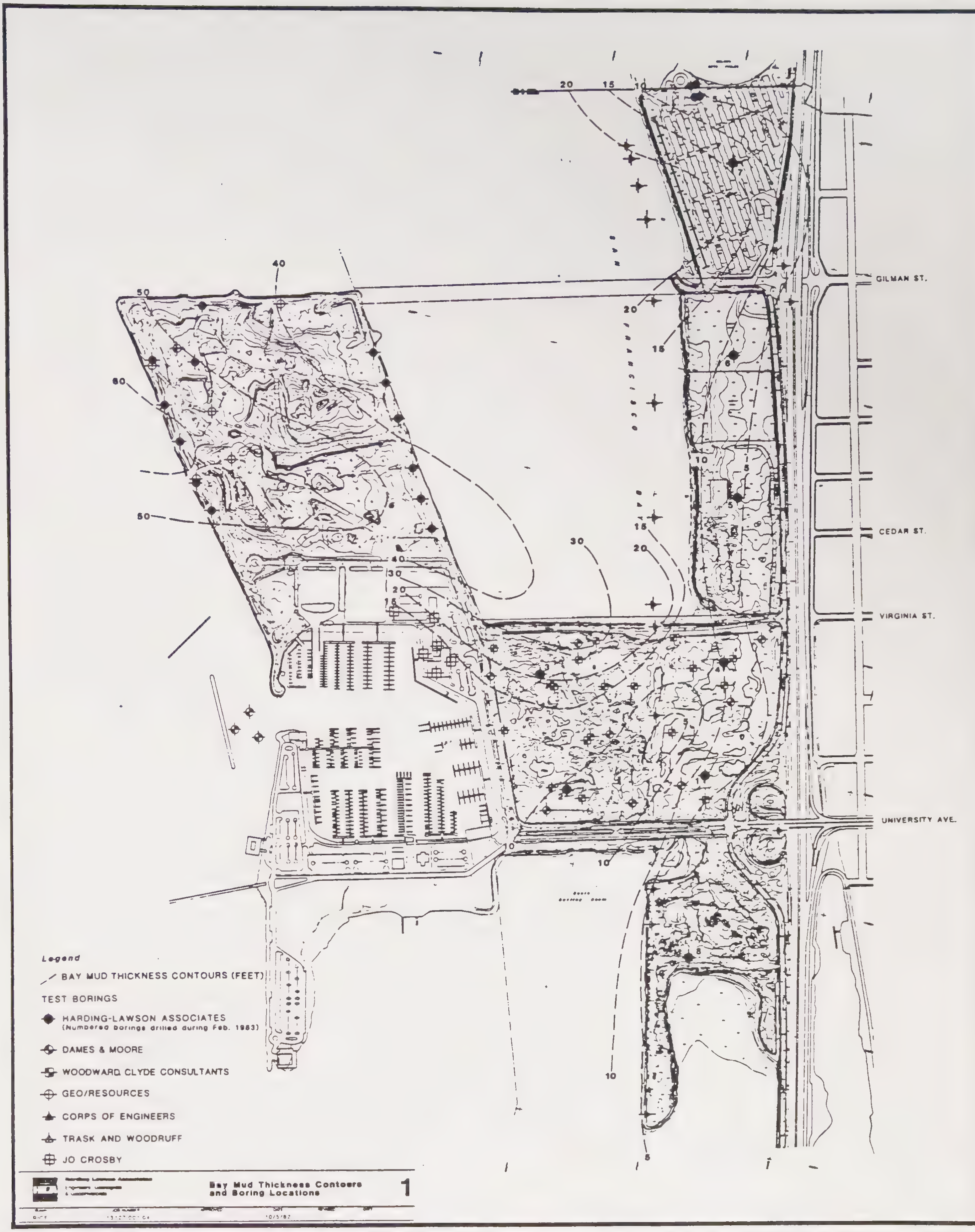
Preliminary Pavement Sections

Area	Approximate Traffic Index
Automobile Parking Lots	4.5
Access and Service Roadways	5.5
Main Arterial Roads	8.0

		Thickness Inches		
TI	Asphalt Concerete	Class 2 Aggregate Base	Class 2 Aggregate Sub Base	Total Thickness
4.5	2.5	6.0	6.0	14.5
4.5	2.5	11.0	-	13.5
5.5	3.0	6.0	7.0	16.0
5.5	3.0	12.0	-	15.0
8.0	4.5	7.0	13.0	24.5
8.0	4.5	19.0		23.5

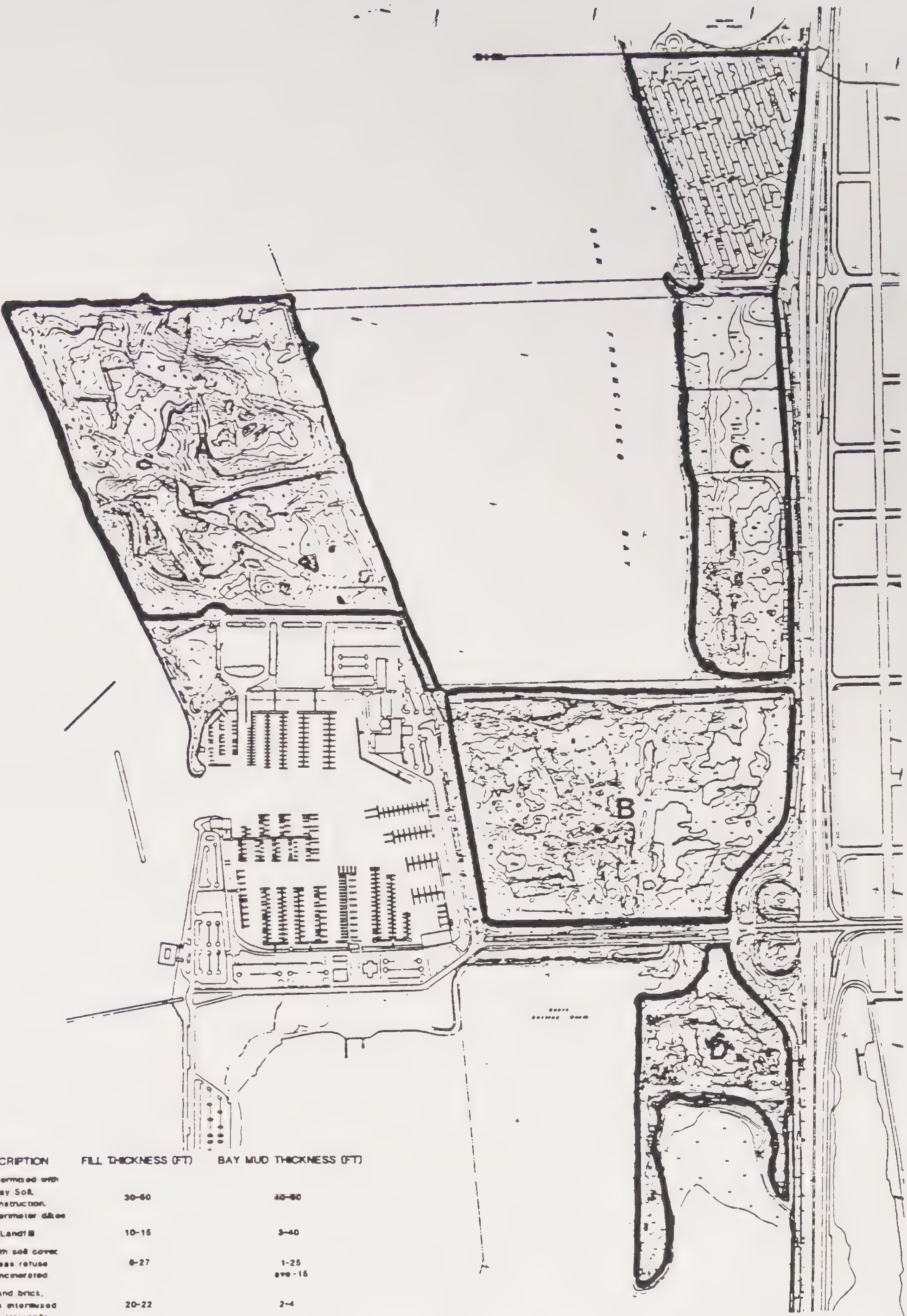
G. Future Geotechnical Studies

A detailed geotechnical investigation should be performed once preliminary site development concepts have been established and prior to final construction of improvements. The detailed investigation should include test borings, laboratory tests and engineering analyses to develop specific grading criteria for the development. Individual soil investigations will likely be required for specific structures.



Berkeley Waterfront

Prepared for: Santa Fe Land Improvement Company 224 South Michigan Avenue Chicago, Illinois 60604
Prepared by: Hall Goodhue Haisley and Barker, Architects and Planners 100 Stevenson Street San Francisco, California 94105
in association with
Keyser Marston Associates 230 California Street 6th Floor San Francisco, California 94111



Legend

AREA	SOIL DESCRIPTION	FILL THICKNESS (FT)	BAY MUD THICKNESS (FT)
A	Refuse Fill intermixed with Sandy Clay Soil, Cellular Construction, Rubble filled perimeter dikes	30-60	40-60
B	Sanitary Landfill	10-15	3-40
C	Refuse fill with soil cover, in some areas refuse has been incinerated	6-27	1-25 ave-15
D	Concrete and brick, rubble debris intermixed with sandy clay soils	20-22	2-4

Areas of Similar Soil Conditions 2

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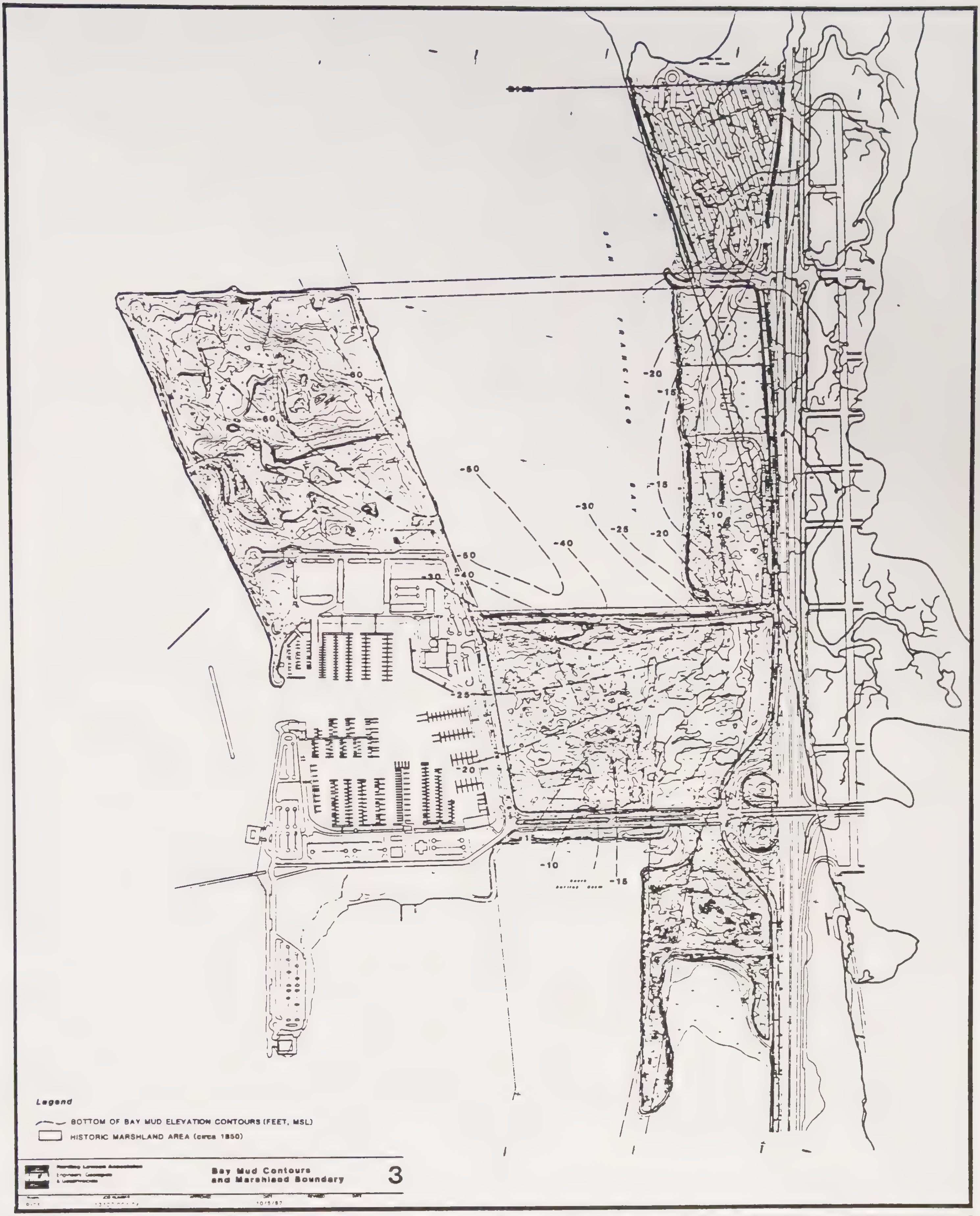
0 200 400 800

10 ac



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0 200 400 800

N

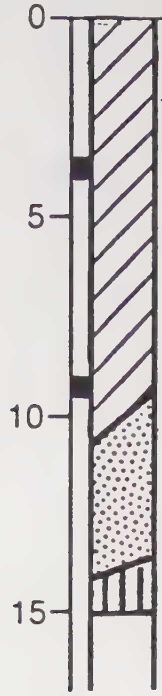
10 sc

LOG OF BORING 1

Equipment 8" Hollow Stem Auger

Elevation +12 Feet[1] Date 2/24/83

Laboratory Tests	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft)
	14			
	6			
	1			



BLACK SANDY CLAY (CL-CH)
stiff, very moist

ground water level
measured 3/31/83

color change to brown,
becomes very stiff with
brick and gravel fragments

becomes saturated

Debris Fill
metal, wood and glass
fragments in clay matrix

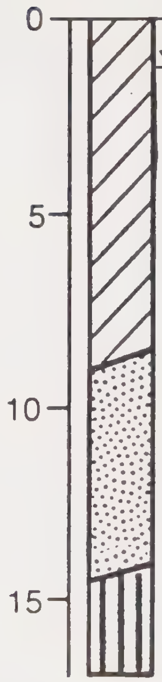
DARK GRAY CLAYEY SILT (MH)
very soft, saturated
(Bay Mud)

FILL

LOG OF BORING 2

Equipment 8" Hollow Stem Auger

Elevation +10.5 Feet Date 2/24/83



BLACK SANDY CLAY (CL-CH)
stiff, moist, with roots

ground water level
measured 3/31/83

Debris Fill
decomposed wood fragments,
tires, nails, etc.

DARK GRAY CLAYEY SILT (MH)
soft, saturated (Bay Mud)

Notes
1. Elevations are based on mean lower low water datum
2. Blow counts have been converted to standard penetration values

Harding Lawson Associates
Engineers, Geologists & Geophysicists

Log of Borings 1 and 2
Berkeley Waterfront Project
Berkeley, California

PLATE **4**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
RICE	13127,001.04		6/3/83		

Laboratory Tests	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft)	Sample
	1			13	

Equipment 8" hollow stem auger

Elevation +10.5 Feet Date 2/24/83

DARK BROWN GRAVELLY SANDY CLAY (CL)
stiff, moist

ground water level measured 3/31/83

Garbage Fill
household garbage, wood, paper, metal fragments mixed with clayey gravel, organic odor

GRAY CLAYEY SILT (MH)
soft, saturated

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Engineers, Geologists
& Geophysicists

Log of Boring 3
Berkeley Waterfront Project
Berkeley, California

PLATE 5

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
SHIELDS	13127,001.04		6/3/83		

Equipment 8" hollow stem auger

Elevation +11 Feet Date 2/25/83

Laboratory Tests	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft)	Sample
				0	
				5	
				10	
	6				
				15	
	6				
				20	
				25	
				30	
				35	
				40	

BROWN SANDY CLAY (CL)
stiff, saturated

ground water level
measured 3/31/83

Debris Fill
metal fragments, wood, in a clay matrix

CLAYEY SILT (MH)
soft, saturated, mixed with wood, glass and metal
gasoline odor

Harding Lawson Associates
Engineers, Geologists
& Geophysicists

Log of Boring 4
Berkeley Waterfront Project
Berkeley, California

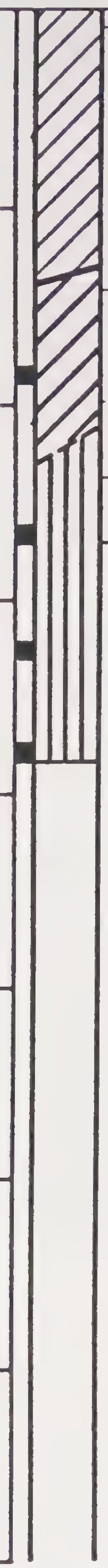
PLATE
6

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
SHIELDS	13127,001.04		6/3/83		

Laboratory Tests	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft)	Sample
				0	
				5	
	4				
				10	
	8				
				15	
	8				
	9				
				20	
				25	
				30	
				35	
				40	

Equipment 8" Hollow Stem Auger

Elevation +14 Feet Date 2/25/83



DARK BROWN SANDY CLAY (CL)
stiff, very moist, with gravel and brick fragments

ground water level measured 3/31/83

DARK GRAY SANDY CLAY (CH-CL)
medium stiff, saturated, with glass, brick and gravel fragments

DARK GRAY SANDY CLAYEY SILT (MH)
mixed with brick, wood, and glass fragments
organic odor

Harding Lawson Associates
Engineers, Geologists & Geophysicists

Log of Boring 5
Berkeley Waterfront Project
Berkeley, California

PLATE 7

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
SHIELDS	13127.001.04		6/3/83		

Equipment 8" hollow stem auger

Elevation +13 Feet Date 2/25/83

Laboratory Tests	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft)	Sample	
				0		2" ASPHALT CONCRETE OVER
						8"BROWN SANDY GRAVELLY CLAY(CL) stiff, moist
						ground water level measured 3/31/83
				5		BLACK SANDY CLAY (CL) stiff, saturated, with gravel, metal fragments, organic odor
						BLACK SANDY CLAYEY SILT (MH) very soft, saturated
	1			10		
				15		
				20		
				25		
				30		
				35		
				40		

Harding Lawson Associates
Engineers, Geologists
& Geophysicists

Log of Boring 6
Berkeley Waterfront Project
Berkeley, California

PLATE
8

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
SHIELDS	13127,001.04		6/3/83		

Equipment 8" Hollow Stem Auger

Elevation ±15.8 Feet Date 3/16/83

Laboratory Tests	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft)
				0
	8			
				5
	2			
				10
	13			
				15
	13			
				20
				25
				30
				35
				40

Sample

1-1/2" A.C. OVER 3" BASE

GRAY BROWN SANDY CLAY (CL) medium stiff, moist

DARK GRAY SANDY CLAY (CL) stiff, moist, with glass and metal fragments organic odor

ground water level measured 3/16/83

BLACK CLAYEY SAND (SC) loose, saturated, with organic odor

GRAY GREEN CLAYEY SILT (MH) soft, saturated (Bay Mud)

GRAY SILTY SAND (SM) saturated, medium dense

FILL

Harding Lawson Associates
Engineers, Geologists & Geophysicists

Log of Boring 7
Berkeley Waterfront Project
Berkeley, California

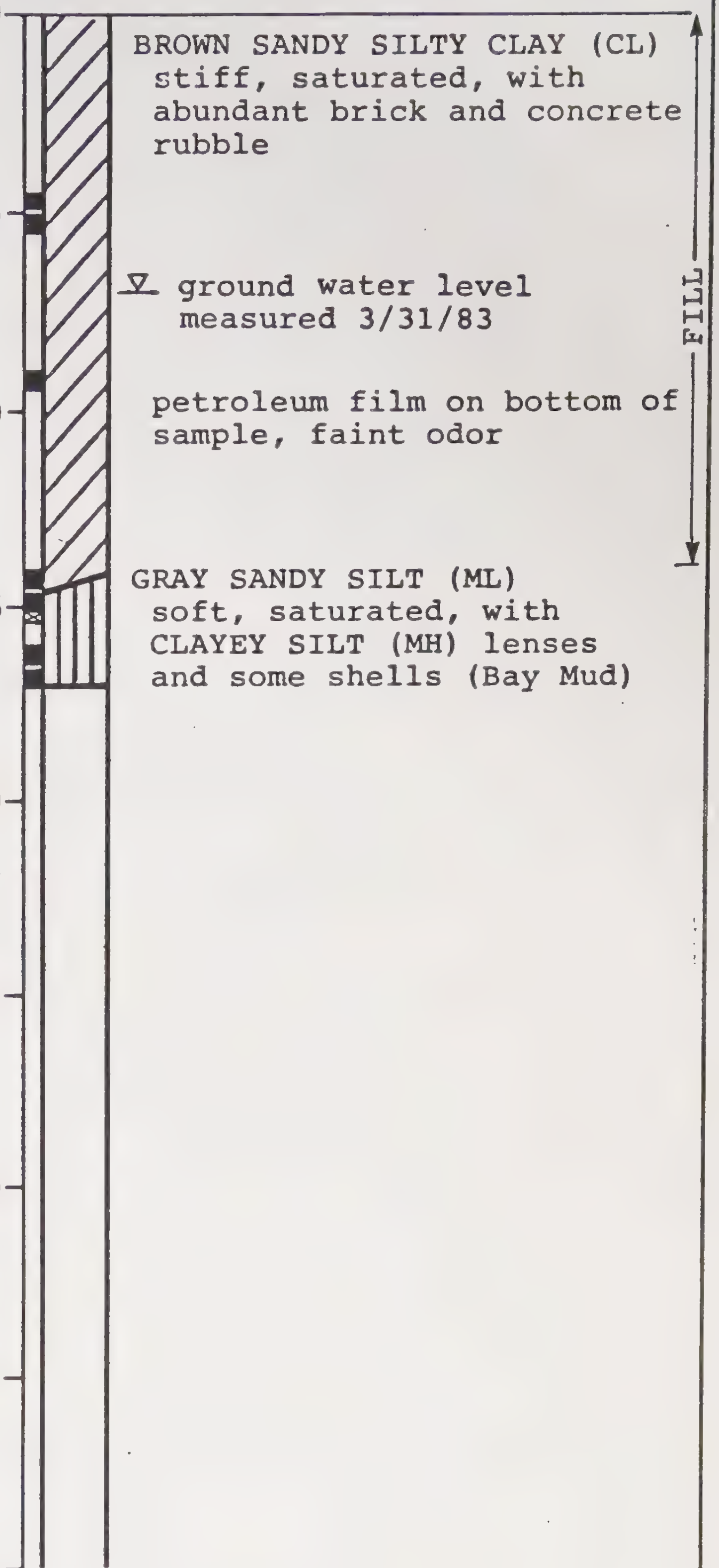
PLATE 9

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
RICE	13127.001.04		6/3/83		

Equipment 8" hollow stem auger

Elevation +14 Feet Date 3/16/83

Laboratory Tests	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft)	Description
				0	BROWN SANDY SILTY CLAY (CL) stiff, saturated, with abundant brick and concrete rubble
	22			5	
					▽ ground water level measured 3/31/83
	11			10	petroleum film on bottom of sample, faint odor
	2			15	GRAY SANDY SILT (ML) soft, saturated, with CLAYEY SILT (MH) lenses and some shells (Bay Mud)
	2				
				20	
				25	
				30	
				35	
				40	



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Log of Boring 8
Berkeley Waterfront Project
Berkeley, California

PLATE 10

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
RICE	13127,001.04		6/3/83		

RF3A

MAJOR DIVISIONS				TYPICAL NAMES
COARSE GRAINED SOILS (MORE THAN HALF IS LARGER THAN #200 SIEVE)	GRAVELS (MORE THAN HALF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE SIZE)	CLEAN GRAVELS WITH LITTLE OR NO FINES	GW	WELL GRADED GRAVELS, GRAVEL - SAND MIXTURES
			GP	POORLY GRADED GRAVELS, GRAVEL - SAND MIXTURES
		GRAVELS WITH OVER 12% FINES	GM	SILTY GRAVELS, POORLY GRADED GRAVEL - SAND - SILT MIXTURES
			GC	CLAYEY GRAVELS, POORLY GRADED GRAVEL - SAND - CLAY MIXTURES
	SANDS (MORE THAN HALF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE SIZE)	CLEAN SANDS WITH LITTLE OR NO FINES	SW	WELL GRADED SANDS, GRAVELLY SANDS
			SP	POORLY GRADED SANDS, GRAVELLY SANDS
		SANDS WITH OVER 12% FINES	SM	SILTY SANDS, POORLY GRADED SAND - SILT MIXTURES
			SC	CLAYEY SANDS, POORLY GRADED SAND - CLAY MIXTURES
FINE GRAINED SOILS (MORE THAN HALF IS SMALLER THAN #200 SIEVE)	SILTS AND CLAYS (LIQUID LIMIT LESS THAN 50)		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS, OR CLAYEY SILTS WITH SLIGHT PLASTICITY
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			OL	ORGANIC CLAYS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS (LIQUID LIMIT GREATER THAN 50)		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACIOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS
			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS			Pt	PEAT AND OTHER HIGHLY ORGANIC SOILS

UNIFIED SOIL CLASSIFICATION SYSTEM

Shear Strength, psf

Confining Pressure, psf

Consol	— Consolidation	*Tx	320	(2600)	Unconsolidated Undrained Triaxial
LL	— Liquid Limit (in %)	TxCU	320	(2600)	Consolidated Undrained Triaxial
PL	— Plastic Limit (in %)	DS	2750	(2000)	Consolidated Drained Direct Shear
G_s	— Specific Gravity	FVS	470		Field Vane Shear
SA	— Sieve Analysis	*UC	2000		Unconfined Compression
■	"Undisturbed" Sample	LVS	*700		Laboratory Vane Shear
⊠	Bulk Sample				

Notes: (1) All strength tests on 2.8" or 2.4" diameter samples unless otherwise indicated.

(2) * Indicates 1.4" diameter sample.

KEY TO TEST DATA

Harding Lawson Associates
Engineers, Geologists
& Geophysicists

Soil Classification Chart & Key to Test Data
Berkeley Waterfront Project
Berkeley, California

PLATE 11

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
SHIELDS	13127,001.04		6/3/83		

DISTRIBUTION

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Hall, Goodhue, Haisley and Barker
Architects and Planners
100 Stevenson Street
San Francisco, California 94105

Attention: Mr. Bryan Grunwald

RWR/JPB/HTT:sao

QUALITY CONTROL REVIEWER

Henry T. Taylor

Henry T. Taylor
Civil Engineer - 8787

Ecological Reconnaissance

WESCO WESTERN ECOLOGICAL SERVICES COMPANY

June 21, 1983
HGH8105

Mr. Bryan Grunwald
Hall, Goodhue, Haisley, and Barker
100 Stevenson St.
San Francisco, CA 94105

Re: Berkeley Waterfront Biological Survey

Dear Mr. Grunwald:

As per our written agreement authorized by you on May 14, 1982, we have conducted a reconnaissance biological survey of the Berkeley Waterfront study area.

Summary and Discussion

The study area does not support any natural biological communities which are considered critical or even highly sensitive. The terrestrial communities are typical weed fields interspersed with disturbed ground, trash dumps, bare dirt, and pavement. No unusual plants or animals reside in the upland areas. As you know, however, a major issue of concern to local and regional agencies will be the potential effects of any project(s) on the adjacent San Francisco Bay and its shoreline. The marine environment in the study area is typical of that found along much of the bay's edge, consisting largely of rip-rapped shoreline leading into mudflats. Saltmarsh communities are not present in significant amounts, and much of the shoreline grades quickly into deeper water.

We anticipate that any development which would invlove filling or dredging of the local bay environment will be met with opposition both as a matter of agency policy and special interest group concern. Severe restrictions on shoreline development are well precedented and, in view of historic trends, well founded. However, the ultimate goal of these policies is to preserve and enhance shoreline quality and prevent additional losses of habitat. With respect to the Berkeley Waterfront area, development does have the potential for adverse impacts, but also, if planned carefully, has the potential to clean up and enhance the area biologically as well as aesthetically.

Any alterations in the shoreline, to be approved, will probably require mitigation. The study area contains several opportunities to provide adequate compensation for the impacts which are likely to occur with planned development. For example, a small mudflat in the Brickyard Cove area could be upgraded and enhanced as saltmarsh habitat. This, combined with the incorporation of public access and a certain amount of open space, could provide a basis for discussion with the agencies involved and have the potential to maintain or increase the area's natural productivity.

The following sections provide more detailed discussions of the topics investigated. Attachments 1 and 2 are a site map with biological features and a list of references and contacts, respectively.

Vegetation

Only about half of the study area's land supports significant vegetation cover. The other half consists of bare soil, pavement, and assorted deposits of trash, fill materials, and bricks. No significant natural vegetation occurs in the area except for several small patches of wetland vegetation. Attachment 1 shows tthe extent and location of the area's notable vegetation features.

The vegetation which is present is composed almost completely of introduced weeds, including the following dominant species:

wild radish	*Raphanus sativus*
mustard	*Brassica* sp.
wild oat	*Avena fatua*
poison hemlock	*Conium maculatum*
thistles	*Carduus pycnocephalus*
	Cirsium spp.
sweet fennel	*Foeniculum vulgare*
wild barley	*Hordeum* spp.
Italian ryegrass	*Lolium multiflorum*

Scattered patches of native shrubs are present, including blackberry (*Rubus* sp.), coyote bush (*Baccharis pilularis* spp. *consanguinea*), and willow (*Salix* sp.). Overall, the vegetated portions of the site consist of a dense cover of herbaceous weeds and occasional shrubs.

There are no known rare or endangered plant species on the site (California Native Plant Society [CNPS] 1980, 1981, 1982), and no unusual or sensitive populations were encountered during the field survey. Even the small wetland patches consist of common, even aggressive, species. These areas probably total no more than one acre. A rare plant location reported by the California Department of Parks and Recreation (1982), including the rare *Cordylanthus mollis* (subspecies unspecified) at the south end of the brickyard, is apparently undocumented (R. York, California Natural Diversity Data Base, pers. comm.; Dr. L. Heckard, Jepson Herbarium, U.C. Berkeley, pers. comm.; CNPS, 1980, 1981, 1982, and ongoing). This location is probably a carryover of an historic collection, as both CNPS and Dr. Heckard are unaware of any such populations of *Cordylanthus* in this region. Further, any *Cordylanthus* population in this area would more likely be *C. maritimus* ssp. *martimus* (a coastal saltmarsh plant) rather than *C. mollis* ssp. *mollis* (known from the San Pablo and Suisun Bay areas).

No *Cordylanthus* populations or individuals were encountered during the field survey, and no significant suitable marsh habitat was found in the study area, including the area reported in the Parks and Recreation report.

Wildlife

Wildlife in the Berkeley waterfront project area are typical of bayside environs. The weedy upland fill areas are inhabited by a variety of birds which are often associated with urban habitat. Common birds include the mourning dove (*Zenaidura macroura*), starling (*Sturnus vulgaris*), Brewer's blackbird (*Euphagus cyanocephalus*), American goldfinch (*Spinus tristis*), house finch (*Carpodacus mexicanus*), and song sparrow (*Melospiza melodia*). Other common but less conspicuous animals in the area include the house mouse (*Mus musculus*), rat (*Rattus norvegicus* and *R. rattus*), vole (*Microtus californicus*), and western fence lizard (*Sceloporus occidentalis*).

The bay, bay shoreline, and mudflats in the project area provide valuable resting and feeding habitat for large numbers of waterbirds. Waterbird populations in the Bay Area (and hence, in the project area) are generally highest in early winter corresponding with the peak migratory period. Population levels typically remain fairly high through the winter and early spring and

show a gradual decline to lower summer levels. By the end of July, waterbird numbers begin increasing again with the arrival of early migrant shorebirds. Waterbirds observed during the field survey included the great egret (Casmerodius albus), snowy egret (Leucophoyx thula), black-crowned night heron (Ardea herodias), killdeer (Charadrius vociferus), and herring gull (Larus argentatus).

The most significant area for wildlife in the project area is the mudflat in Brickyard Cove at the north end of Strawberry Beach. This area is valuable primarily as a feeding and resting site for shorebirds, waterfowl, gulls, terns, herons, and egrets.

None of the study area's shoreline habitats are particularly suitable for permanent residency by the types of birds mentioned above. Suitable marsh habitat is also lacking for the Bay Area's endangered wildlife species including the clapper rail (Rallus longirostris), black rail (Latterallus jamaicensis), and salt marsh harvest mouse (Reithrodontomys raviventris). The habitats simply do not contain significant amounts of marsh vegetation. The mudflats are, however, used occasionally by species such as the brown pelican (Pelicanus occidentalis), and may be used sporadically as foraging areas for the peregrine falcon (Falco peregrinus) and least tern (Sterna albifrons).

Marine Resources

The study area contains typical bayshore environments, including rip-rapped shorelines, mudflats, narrow sand/gravel beaches, and shallow open water. The gradually sloping shorelines and mudflats are the more natural marine habitats of the area, and contain an apparently normal compostion of macroinvertebrates. Most of the shoreline is steeper, however, and consists of heavily rip-rapped banks leading into open water. The macroinvertebrate species present indicate that industrial or domestic pollution is not a major factor along most of the shoreline areas. Attachment 3 is a partial list of organisms identified through sampling. With the exception of Gemma gemma, most of the species (especially Ampelisca milleri) are associated with areas that are not even marginally polluted. The distribution of macroinvertebrates appears to be uniform throughout the shoreline areas, except at the three storm drains where no sampling was conducted.

The most valuable marine habitat in the project area is the mudflat in Brickyard Cove (see Attachment 1). This area lacks even the most common saltmarsh plants, however, and although the intertidal elevations appear to be suitable for cordgrass (Spartina foliosa), saltmarsh vegetation is generally lacking. Further, there are no significant upper marsh or transition communities present. The study area is extremely sparse in terms of saltmarsh and related vegetation.

The storm drain areas appear to contain a substantial amount of nutrients and/or wastes. Strong odors were detected in these areas, and they probably contain a high compostion of anaerobic benthos and a very low macroinvertebrate population. Overly high nutrient/waste compostion is indicated by the luxurient attached algae in these areas. This potential water quality problem could require correction if saltmarsh vegetation were to be introduced.

It is reported that the storm drain outfall areas contain high fecal coliform counts due apparently to animal and other wastes from city streets. This aspect of the study area was not examined quantitatively during our survey, but visual evidence indicates that these outfall areas may, indeed, be detrimental to the local marine biota and associated bird life, in addition to presenting a possible public health hazard. The biological values of these areas are currently negative, and are strictly the result of upslope input (runoff, oil, grease, and waste from city streets, etc.). This is a problem with potenetially significant local impact in the study area, which can be overcome only through substantial offsite effort (e.g., pet waste control or modification to street cleaning procedures throughout the upslope cities) or perhaps expanded biological filtering and treatment (i.e., a developed marsh system). Some alleviation of the problem may be possible through improvement of local circulation to and from the outfalls by tidal action, or perhaps via dilution with other local water sources/drainages. Further studies would be required to determine the feasible alternatives and degree of effort needed to restore positive biological value to the outfall areas. In any case, the current situation should not be significantly aggravated by any development in the study area, and the resolution of which should not be construed as the responsibility of the developer.

No significant marine organisms or habitats appear to be threatened by potential development of the study area, assuming that neither of the two major mudflats will be dredged or filled. If a marina were to be constructed, the establishment of a viable saltmarsh represents reasonable mitigation. This might be accomplished at the mudflat in Brickyard Cove. The shoreline between the existing Berkeley Marina and the Albany Landfill is too exposed to fetch and wave action to be suitable, as is the Strawberry Beach area.

Impacts of Development

Until plans have been formulated showing areas and types of disturbance, the assessment of specific impacts cannot be made. However, in view of the area's relatively low natural terrestrial values (compared to natural shoreline areas), it is expected that no significant land resources would be directly damaged or lost with reasonable development. However, the potential cumulative loss of physical shoreline habitat, and disturbance or elimination of some intertidal flats, are important considerations. Most likely, development of the area would include the following types of impacts, the most important of which center on the marine resources of mudflats and shoreline beaches.

- Loss of weedy upland vegetation. Not highly significant, but will affect local songbird, lizard, rodent, and insect populations.

- Possible loss of shoreline feeding areas for wildlife due to physical grading or dredging; also, the quality of these areas may decline due to encroachment of development and increased access.

- Possible minor disturbance to remaining shoreline habitats due to increased activities.

- Possible loss or degradation of weedy upland buffer between bay margins and current development.

- Possible increase in contamination of local shorelines due to urban runoff of oil, grease, etc.

Recommended Mitigation

The following are possible areas of mitigation for the probable impacts of development of the study area. These are general measures which should be considered within any development scheme and would require detailed refinement and discussions with the appropriate agencies (e.g., BCDC, U.S. Fish and Wildlife Service [FWS], California Department of Fish and Game [CDFG], Coastal Conservancy). These alternative measures, either individually or in combination, should provide a basis for designing an appropriate mitigation plan.

- Consider establishing saltmarsh vegetation in currently bare upper mudflat areas of Brickyard Cove (see Attachment 1). These areas appear to be suitable for marsh development and may only require planting of the relevant species. Care should be taken to provide a natural zonation of mudflat, saltmarsh, and buffer zone. A varied marsh community supplementing the existing mudflats would significantly increase these areas' productivity and enhance the areas as habitat.

- Provide a vegetated buffer strip of approximately 20 yards between any buildings or other extensive development and shoreline areas with mudflats (see Attachment 1) to reduce direct (access) and indirect (noise, visual contact) disturbance to the mudflat habitats. This buffer could be incorporated into a trail easement. The width of the buffer zone can be variable, allowing for a reduced width, as long as adequate landscaping is provided. Other shoreline areas without mudflats should also be buffered to the extent possible, even if this only means planting trees and shrubs to interrupt the direct line of sight and soften the contrast between structures and the shoreline.

- Utilize native trees and shrubs in local landscaping. These could include pines, cypress, willows, coyote bush, coastal sagebrush, etc. A wide variety of colorful and hardy herbs are also available for bedding areas and general covers.

- o Explore the feasibility of cleanup effort for the stormdrain outfalls in order to improve local biological values.

Need For Further Studies

Depending on future plans for the study area, the following are topics which should be investigated in greater detail:

- o Examine stormdrain outfalls at selected points (see Attachment 1) in conjunction with potential nutrient overloads or toxic substance input. This assessment (and ongoing monitoring) would be necessary prior to any marsh establishment in these areas.

- o Explore the potential for creating new intertidal surfaces (fill deposits) and/or islands from dredge spoils obtained from marina development.

- o A more detailed marine organism survey may be needed for specific areas if development is planned which will fill or dredge bay waters or directly affect shorelines.

Conclusions

The following highlights the results of our investigations and our general conclusions at this early planning phase:

- o The study area does not contain critically significant biological resources, particularly on the landfill areas, but is considered valuable because of the adjacent mudflats and shoreline areas.

- o Careful development of the area (avoiding mudflats and including certain environmental protections) would not necessarily destroy or degrade the area's biological productivity and value.

- o Opportunities do exist for adequately mitigating the expected environmental impacts of development.

- It will be very important to work with regulatory agencies, local cities, and other organizations in arriving at an acceptable mitigation plan for biological resources.

We appreciate the opportunity to provide this input on this project and hope that it will be of value in your planning. We anticipate a significant effort to be needed in negotiating with various agencies, and would be willing to participate in developing more detailed plans if you so desire.

If you have any questions regarding our survey or future planning, please feel free to call.

Sincerely,

WESTERN ECOLOGICAL SERVICES COMPANY

Charlie Patterson /gRZ

Charles Patterson
Senior Plant Ecologist

Steve Foreman /gRZ

Steven A. Foreman
Wildlife Biologist

Charles R Pride III

Charles R. Pride, III
Marine Biologist

Greg R Zitney

Greg R. Zitney
Principal

CP/pac

Attachments (3)

Attachment 2

References and Contacts

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California Department of Fish and Game (CDFG). 1979. List of designated endangered or rare plants. List of California protected species compiled by CDFG Rare Plant Office. Sacramento, California.

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Munz, P.A. 1968. Supplement to a California flora. Univ. of Calif. Press. Berkeley, Los Angeles.

U.S. Fish and Wildlife Service (FWS). 1980. Endangered and threatened wildlife and plants; review of plant taxa for listing as endangered or threatened species. 50 CFR, Part 17. Fed. Reg. 45 (242), Dec. 15, 1980.

- California Natural Diversity Data Base
  Sacramento, California
  Mr. Rick York - Rare plant specialist

- Jepson Herbarium
  University of California, Berkeley
  Dr. Lawrence Heckard - Expert on Cordylanthus

Archaeological Records Search

California Archaeological Inventory

ALAMEDA
CONTRA COSTA
DEL NORTE
HUMBOLDT
LAKE
MARIN
MENDOCINO
NAPA
SONOMA

Northwest Information Center
Department of Anthropology
Sonoma State University
Rohnert Park, California 94928
(707) 664-2494

21 June 1982

File No.: 1448-H

Bryan Grunwald
Hall, Goodhue, Haisley, and Barker
100 Stevenson Street
San Francisco, CA 94105

re: Archaeological Records Search for Property on the Berkeley Waterfront, Alameda County.

Dear Mr. Grunwald:

Per your request of 9 June 1982, an archaeological records search was conducted. The records search consisted of a review of pertinent literature on file at the Northwest Information Center.

There were no previously recorded archaeological sites, National Register sites, or California Historical Landmarks situated within or immediately adjacent to the project boundaries. There were nine archaeological sites recorded within one-half mile of the eastern boundary of the project area. These and other previously recorded archaeological sites in the general vicinity were situated on flat to gently sloping terrain at elevations above the bay shoreline, usually in close proximity to freshwater sources. A comparison was made of the mapped location of the project area that you had provided and a map which depicted the former shorelines of San Francisco Bay (Nichols and Wright 1971). As a result of this comparison, it was concluded that the subject property was situated within an area that had been subject to continuous inundation during the mid-nineteenth century. Archaeological field surveys that had been conducted within the project boundaries and nearby in environmental settings similar to that of the project area did not find archaeological resources.

In consideration of the above, the project area was determined to be of low archaeological sensitivity and further archaeological study is not recommended at this time. However, there remains the possibility of subsurface archaeological materials. Prehistoric materials included, but are not limited to, obsidian or chert flakes and artifacts, concentrations of shell, bone, mortars and pestles, and human burials. Historic materials include, but are not limited to, stone foundations and walls, structural remains with square nails, ceramics, sun tinted glass, and refuse deposits. In the event that such materials are found during the construction phases of the project, it is recommended that work in the immediate vicinity of the find be temporarily halted and that a qualified archaeologist (see enclosed referral list) evaluate the situation in order to provide recommendations for the protection of significant archaeological resources.

You should be aware that if Federal funds, permits, or land are involved with the proposed project, an archaeological field survey may be required to conform with Federal regulations.

Thank you for using our services. Please sign and return the enclosed confidentiality form. If you have any questions, do not hesitate to contact our office.

Sincerely,
Allan G. Bramlette
Assistant Coordinator

Lisa C. Hagel

Lisa C. Hagel
Curatorial Assistant

Enclosures: Agreement of Confidentiality
Archaeological Consultants Referral List

AGB/LCH:lch

Literature Reviewed

In addition to the archaeological maps and site records on file at the Northwest Information Center of the California Archaeological Inventory, Sonoma State University, the following archaeological, ethnographic, and historic literature was reviewed.

Chavez, David
1977 Preliminary Cultural Resources Assessment of the East Bay Municipal Utility District (EBMUD) Wet Weather Facilities/Overflow Project Facilities Sites, Alameda and Contra Costa Counties, California. Report on file at the Northwest Information Center, Sonoma State University. File #S-779.

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1978 Costanoan. In Handbook of North American Indians, Volume 8, California. R.F. Heizer, ed. Washington D.C.: Smithsonian Institution. pp. 398-413.

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Utilities Survey

SITE UTILITIES REPORT

FOR

BERKELEY WATERFRONT

July 1982

Prepared for:

Hall Goodhue Haisley and Barker

Prepared by:

Wilsey & Ham
1035 E. Hillsdale Boulevard
Foster City, California 94404
Project No. 1-143-0201-St-2

INTRODUCTION

This report discusses the conditions and requirements associated with the development of the project site, with emphasis on the location and capacity of existing utilities. The findings are based upon Wilsey & Ham's preliminary investigations and discussions with representatives of various agencies, both public and private, who have jurisdiction over this site. A list of the agency representatives contacted is included as Appendix A. The preliminary plans, consisting of 4 sheets, show the existing topography and utilities, including the Pacific Gas and Electric, and Pacific Telephone and Telegraph systems. On a second set of base plans, we have drawn the existing water, sanitary sewer, and storm drainage systems. Noted on both sets of plans are items which are referred to in the text of this report.

The topographic map, prepared by Towill Inc., and the various agency plans are assumed to be on the United States Coastal and Geodetic Survey (USC and GS) datum. This should be verified prior to performing a detailed analysis on earthwork requirements.

Although existing utilities and street improvements are near or adjacent to this site, early coordination with the various jurisdictions for their extension and/or relocation is essential during the planning process so as not to impede actual project construction.

A summary of our findings is presented under the subtitles for each important aspect of the development of this site. Responses from the various agencies are included in our findings.

GENERAL SITE CONDITIONS

The study area is located west of I-80 in Berkeley, California. It extends from approximately 2,400 feet south of University Avenue, north to Golden Gate Fields Race Track in the City of Albany. It is bounded by West Frontage Road on the east and by the San Francisco Bay and Marina Boulevard on the west.

The entire study area of approximately 136 acres has been used as a sanitary landfill site. The area south of University Avenue has large amounts of concrete and brick rubble on the surface. The northernmost portion of this study area is paved with asphalt and used as parking facilities for the Golden Gate Fields Race Track.

Access to the study area property is from developed roads which bound the property on all sides, except where the property is adjacent to the San Francisco Bay. The main road adjacent to the property, University Avenue, provides access to the Berkeley Yacht Harbor which is located due west of our study area and consists of the Berkeley Marina, the Marriot Hotel, several restaurants and other places of business. Total acreage of the Berkeley Yacht Harbor, including boat berths, is about 120 acres.

STORM DRAINAGE

An assumption made for this site utilities report is that the finished ground elevation should be close to the elevation of the existing fish pier which extends out from the Berkeley Marina. According to information supplied by the Berkeley Public Works Department, the elevation of the fishing pier is 11.4 feet. As mentioned in the above introduction, this elevation is assumed to be on the same datum (USC and GS) as the topography shown on our plan, but would require verification.

All lands in the study area appear to be capable of achieving this minimum finished ground elevation with some regrading operations. The only area apparently lacking enough fill is the 72.1± acre area just north of University Avenue. Based on an elevation of 11.5 feet, it appears that this area will require approximately 80,000 cubic yards of import fill, in place, assuming no settlement. For each 0.5' of height, 58,000 cubic yards of import fill may be added or subtracted. However, at this time, we have not yet reviewed the Dames & Moore soils report which should contain a detailed analysis of earthwork requirements.

The garbage will most likely present some settlement problems, as evidenced by the bumpy West Frontage Road. The soils engineer should be consulted for estimates of "settlement" so that the import requirements can be adjusted accordingly.

The remainder of the lands within the study area appears to have sufficient earthwork to balance within several sub-areas. If the study area is developed, mass grading will be required under the supervision of the soils engineer. Based on this cursory analysis, no additional import is likely to be required.

According to the Berkeley Public Works Department, the western portion of Virginia Street, which is at elevation 8.5' to 9.0', floods during the rainy season. This street will have to raised if it is to act as a "breakwater."

It appears that the study area can be regraded to release storm drainage by gravity into the Bay. A drainage system of pipes, catch basins and manholes would have to be installed. There is an existing storm drainage system which serves the existing roads and the Marina. The system is shown on the enclosed Water, Sanitary Sewer and Storm drainage Plan.

SANITARY SEWER

The pump station in University Avenue near its intersection with Marina Boulevard transports effluent from the Berkeley Marina through an 8" force main into a 16" cast-iron pipe. This 16" cast-iron pipe crosses under I-80 and connects to the 66" main interceptor pipe which runs southerly along Second Street on the east side of I-80. The City of Berkeley owns and maintains the sanitary system up to this interceptor pipe which is under the jurisdiction of the East Bay Municipal Utility District (EBMUD). Possible connections to the existing sanitary sewer lines could be made at one of the manholes along the 16" cast-iron pipe. Depending on the type and density of the development, the existing system may or may not have sufficient capacity. If it becomes evident that the system is under-designed (which is most likely), then another pump station and force main system may have to be installed and connected to the 66" main interceptor pipe. EBMUD permits connections to this interceptor only at existing manholes, most of which have connection stubs on the west side. A possible conection for development purposes is located just north of University Avenue, along Second Street where there is a 12" stub on the west side. According to John Foster of EBMUD Water Pollution Control, there is no charge for connection to the main interceptor pipe, but an application signed by the City of Berkeley is required. There is a fee of approximately $200.00 (1982 dollars) for connection to the City of Berkeley's system.

WATER

EBMUD has jurisdiction over the water service lines in the area, while the Berkeley Fire Department regulates the fire water lines which branch off EBMUD's water service lines. Fire regulations require pressures of between 2,500 gpm to 5,000 gpm, depending on the development.

Presently, there are two water service line locations west of I-80: a 12" line at Gilman Street and a 12" line at University Avenue. The 12" line at Gilman Street is preceded by an 8" line. Most likely, this 8" line will have to be relined or replaced with a larger size pipe or paralleled with another water line in order to accommodate the increased demand created by development. The 12" line at University Avenue crosses under the freeway one block north of University Avenue at Hearst Avenue. Once the line meets West Frontage Road, it runs south to University Avenue. At the intersection of University Avenue and West Frontage Road, it connects into an 8" line running easterly along University Avenue. A 12" stub is left for future service at this transition. The 8" line extends the length of University Avenue until it reaches Marina Boulevard where it branches into a 12" line running along Marina Boulevard and an 8" and a 12" line continuing along University Avenue. In all probability, the 8" line in University Avenue would be inadequate to meet the needs of the area if it were developed. If expanded service is required, two possible points of connection are the 12" stub at the intersection of University Avenue and West Frontage Road and the point along West Frontage Road where the 12" line extends under the freeway to Hearst Street.

The water system is not looped at present. Any future development will require looping of the system, per fire regulations, and any new development west of I-80 will require complete sprinkler systems. The Berkeley Fire Department is currently drafting updated ordinances and regulations which will become effective by September 1982. Basic requirements follow those set forth by the Insurance Services Office located in San Francisco and in the 1979 edition of the Fire Code and Uniform Building Code.

GAS SERVICE

The existing 3" steel gas line crossing under I-80 at Harrison Street serves the needs of the Golden Gate Fields Race Track. Also crossing under I-80, at Hearst Avenue (1 block north of University Avenue), is a 6" steel gas line which runs south along the West Frontage Road until it meets University Avenue where it runs easterly to serve the needs of the Berkeley Marina, supplying 50 to 60 psi of pressure.

The likeliest point of connection for future development of gas service is along the 6" gas line which extends along West Frontage Road and University Avenue, since this is the closest line to our study area and also there is a transmission point (a point in the system where approximately 125 psi of pressure is generated) directly across I-80 on Hearst Street.

No problem is anticipated with the supply of natural gas to the study area, unless there is going to be heavy industrial usage, in which case, an in-depth study would be required to determine the necessary improvements to the gas system.

Electric Service

A 12,000-volt combination underground and overhead electrical system runs along West Frontage Road servicing the Berkeley Marina by way of University Avenue, and the Golden Gate Fields Race Track via Gilman Street. In addition, an overhead line extends along Virginia Street to service the Berkeley dump. The system is adequate for all needs in the area at present, but may need upgrading, depending on the development area's usage.

PG&E regulations require that electric service be underground unless the developed area is residential and each individual parcel is greater than 3 acres. The existing overhead lines along West Frontage Road and Virginia Street would have to go underground rather than being relocated if they were impeding the development. Otherwise, if the poles were not in the way, one of the existing poles would serve as an underground riser, and service to the developed site would be underground. There are a variety of locations where PG&E can locate service connections: there are numerous splice boxes along University Avenue and numerous poles along West Frontage Road and Virginia Street which could serve as underground risers. Service connection locations would be chosen based on the final site plan.

After October 7, 1982, the customer will be responsible for all connection fee charges for gas and electric, including labor, materials, etc. The present system will not be upgraded until such time as actually necessary. PG&E does not speculate on future service needs. All the normal Public Utility Commission requirements of fees and reimbursements will apply.

PACIFIC TELEPHONE & TELEGRAPH COMPANY (PT&T)

There are existing underground PT&T facilities in University Avenue and in Marina Boulevard. Another system also serves the needs of the Golden Gate Fields Race Track and enters underground via Marin Avenue in Albany (north of our study area). The system is adequate for all current needs in the area, but depending upon the site development, the system may have to be upgraded. PT&T sometimes requires an easement to service the site. If there are public streets on-site, however, PT&T can utilize a portion of them to lay their lines in. The nearest potential connection locations are the splice boxes located along University Avenue and Marina Boulevard. All the normal Public Utility Commission requirements of fees and reimbursements will apply.

SANITARY SEWER CAPACITY

Although the sanitary sewer and storm drainage systems are supposed to be two separate systems, there is a substantial difference in the sanitary sewer flow during wet and dry weather. This is primarily due to infiltration of ground water through weak pipe joints in the sanitary sewer system. Occasionally, individual residents make illegal hook-ups to the sanitary system to drain water, which adds to the problem.

There is no problem with the capacity of the sanitary sewer system in Berkeley or at the treatment plant during dry weather. Typically, the interceptors, including the interceptor which runs along 2nd street that a development in our investigated area would tie into, flow half-full. The treatment plant, which can handle 290 to 300 mgd, typically handles 75 mgd during dry weather.

Wet weather flow, however, is a problem. There is a problem at University Avenue during most winters. Normally the system backs up a few hours or a few days during the winter. For instance, during this last winter (1981-1982) the sanitary sewer system backed up several different times at, and north of, University Avenue. There are problems located elsewhere in the system also.

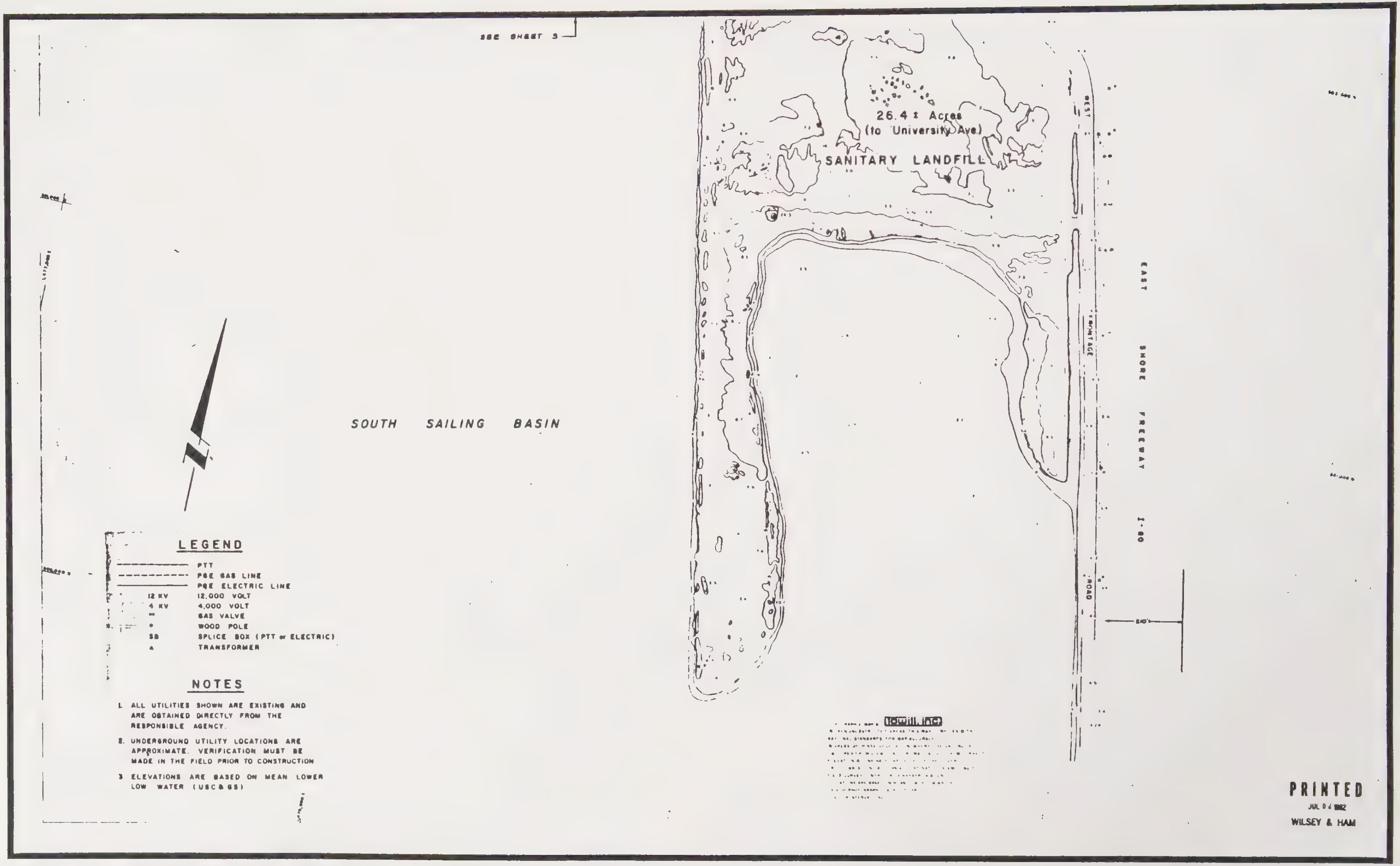
Currently, the Environmental Protection Agency is funding an Infiltration-Inflow study for the area. Money is running out and it is doubtful that any substantial improvements will be made to the system as a result of their investigation. It would be very difficult to improve the system from University Avenue south to the treatment plant. The treatment plant is located at the east end of the Bay Bridge, which is approximately 2.9 miles south of University Avnue.

The main interceptor consists of a 54-inch pipe north of University Avenue, two 30-inch pipes running under University Avenue and one 66-inch pipe running from University Avenue south to the treatment plant. Enlarging this interceptor is near impossible. The 66-inch pipe is located under I-80 and Caltrans most surely would not allow construction on I-80 to interrupt traffic. The possibility of running a parallel line on either side of I-80 is unlikely due to BCDC's easement on the west side of I-80 and large boulders on the east side. EBMUD originally looked into the possibility of running the main interceptor along the east side of the Berkeley Aquatic Park, which is adjacent to I-80 on the east. Borings by the soils engineer revealed large boulders so they decided to run the inteceptor under the shoulder of I-80. Since then, I-80 has been widened and the shoulder is now a lane. The solution depends on the type and density of development from which a flow rate can be determined. If the flow rate is such that a 48-inch pipe or larger is necessary to carry effluent to the main interceptor, EBMUD will most likely answer <u>no</u> to a request for connection. A pipe under 48-inches would be evaluated. For instance, the new 30-story highrise going up now in Emeryville had to build a new structure on the interceptor and connect a 30-inch pipe to it. This highrise is located on the east side of I-80, approximately 1.5 miles south of University Avenue.

APPENDIX A

List of Contacts

Naoki Kaku	**Assistant Civil Engineer** Albany Public Works Department	06/22/82	Personal Vist
Bruce Warner	**Technician** Berkeley Public Works Department	06/23/82	Personal Visit
John Bonwell	**Engineer** Berkeley Public Works Department	06/23/82	Personal Visit
Daryl Nall	**Engineer** Berkeley Public Works Department	06/23/82	Personal Visit
Captain Hyatt	**Fire Department Captain** Berkeley Fire Department	06/30/82	Telephone Conversation
John Foster	**Engineer** EBMUD Water Pollution Control	06/30/82	Telephone Conversation
William McGowan	**Engineer** East Bay Municipal Utility District	06/23/82	Personal Visit
Fred Lang	**Gas Mapper** Pacific Gas & Electric Company	06/22/82	Personal Visit
Donald Stevenson	**Senior Engineering Estimator** Pacific Gas & Electric Company	06/22/82	Personal Visit
Mark Cunningham	**Industrial Power Engineer** Pacific Gas & Electric Company	06/24/82	Personal Visit
Gary England	**Electric Mapper** Pacific Gas & Electric Company	06/22/82	Personal Visit
A. A. Clyde	**Engineer** Pacific Telephone & Telegraph	06/24/82	Personal Visit
Ray Webb	**Engineer** Pacific Telephone & Telegraph	06/24/82	Personal Visit
Allison Thiry	**Engineer** Pacific Telephone & Telegraph	06/30/82	Telephone Conversation



Berkeley Waterfront

Prepared for: Santa Fe Land Improvement Company 224 South Michigan Avenue Chicago, Illinois 60604
Prepared by: Hall Goodhue Haisley and Barker, Architects and Planners 100 Stevenson Street San Francisco, California 94105
In association with
Keyser Marston Associates 230 California Street 6th Floor San Francisco, California 94111

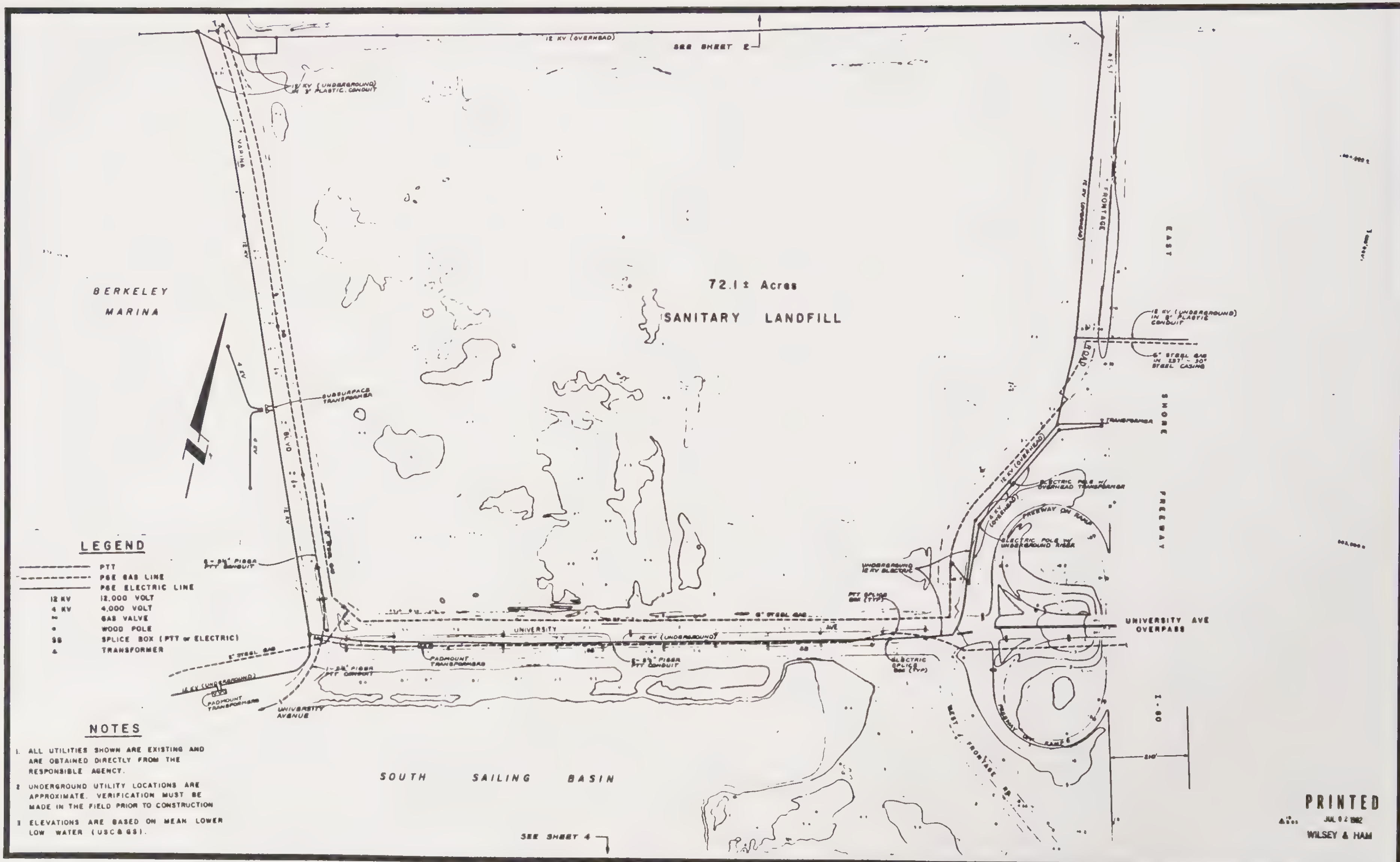
WILSEY & HAM

1035 EAST HILLSDALE BLVD FOSTER CITY, CA. 94404 (415) 349-2151

PACIFIC TELEPHONE & TELEGRAPH AND PACIFIC GAS & ELECTRIC COMPANY UTILITY PLAN

	BY	DATE
Fld Bk No		
Design		
Drawn		
Checked		
Ckd/Comet		
Proj Eng		
Div Eng		

SHEET 4 of 4
JOB NO. 143-0201
SCALE: 1" = 100'
DATE: 6/29/82



Berkeley Waterfront

Prepared for: Santa Fe Land Improvement Company 224 South Michigan Avenue Chicago, Illinois 60604
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WILSEY & HAM

1035 EAST HILLSDALE BLVD FOSTER CITY, CA. 94404 (415) 349-2151

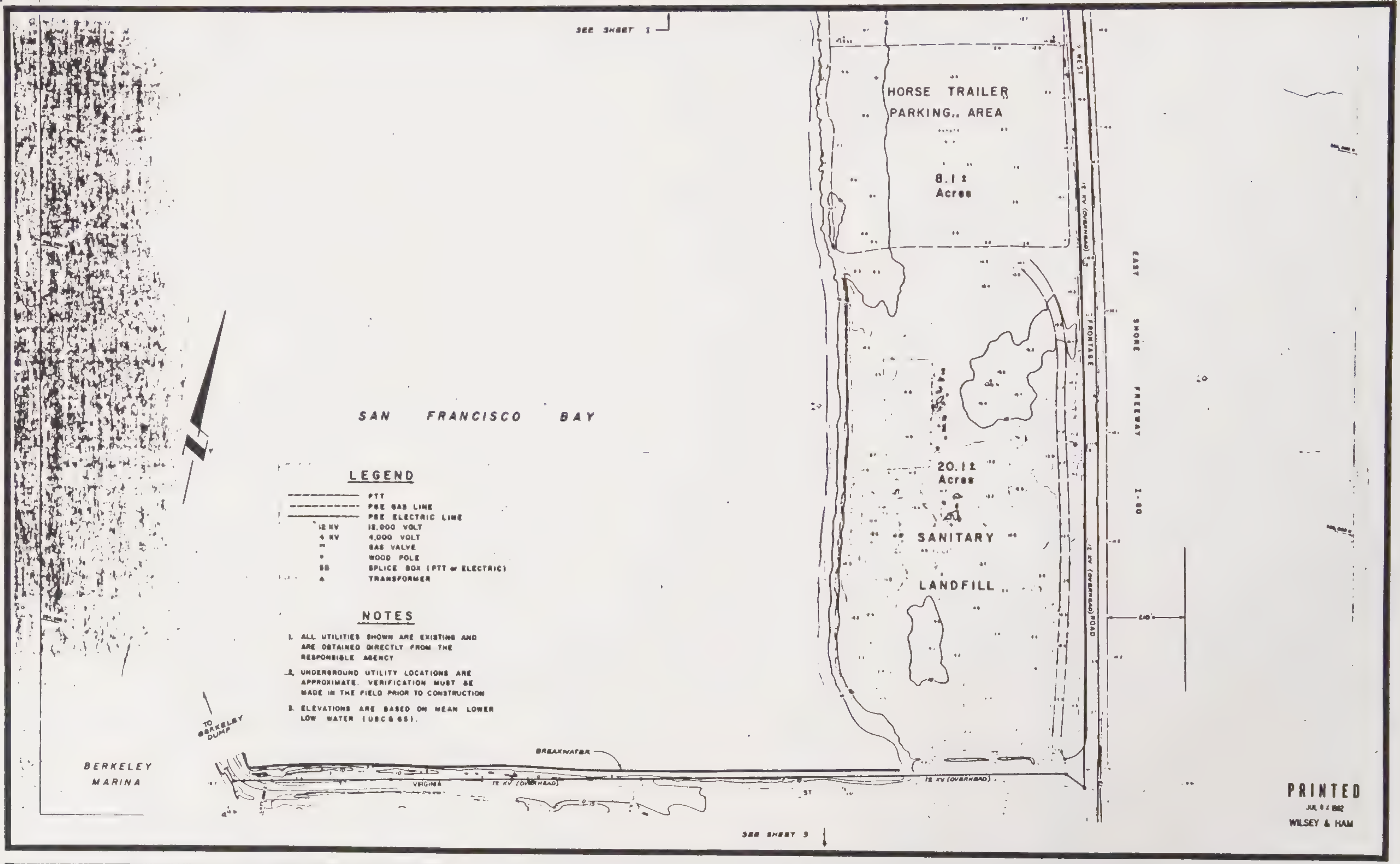
PACIFIC TELEPHONE & TELEGRAPH AND PACIFIC GAS & ELECTRIC COMPANY UTILITY PLAN

SHEET 3 of 4

JOB NO: 143-0201

SCALE: 1" = 100'

DATE: 6/29/82



Berkeley Waterfront

Prepared for: Santa Fe Land Improvement Company 224 South Michigan Avenue Chicago, Illinois 60604
Prepared by: Hall Goodhue Haisley and Barker, Architects and Planners 100 Stevenson Street San Francisco, California 94105
In association with
Keyser Marston Associates 230 California Street 6th Floor San Francisco, California 94111

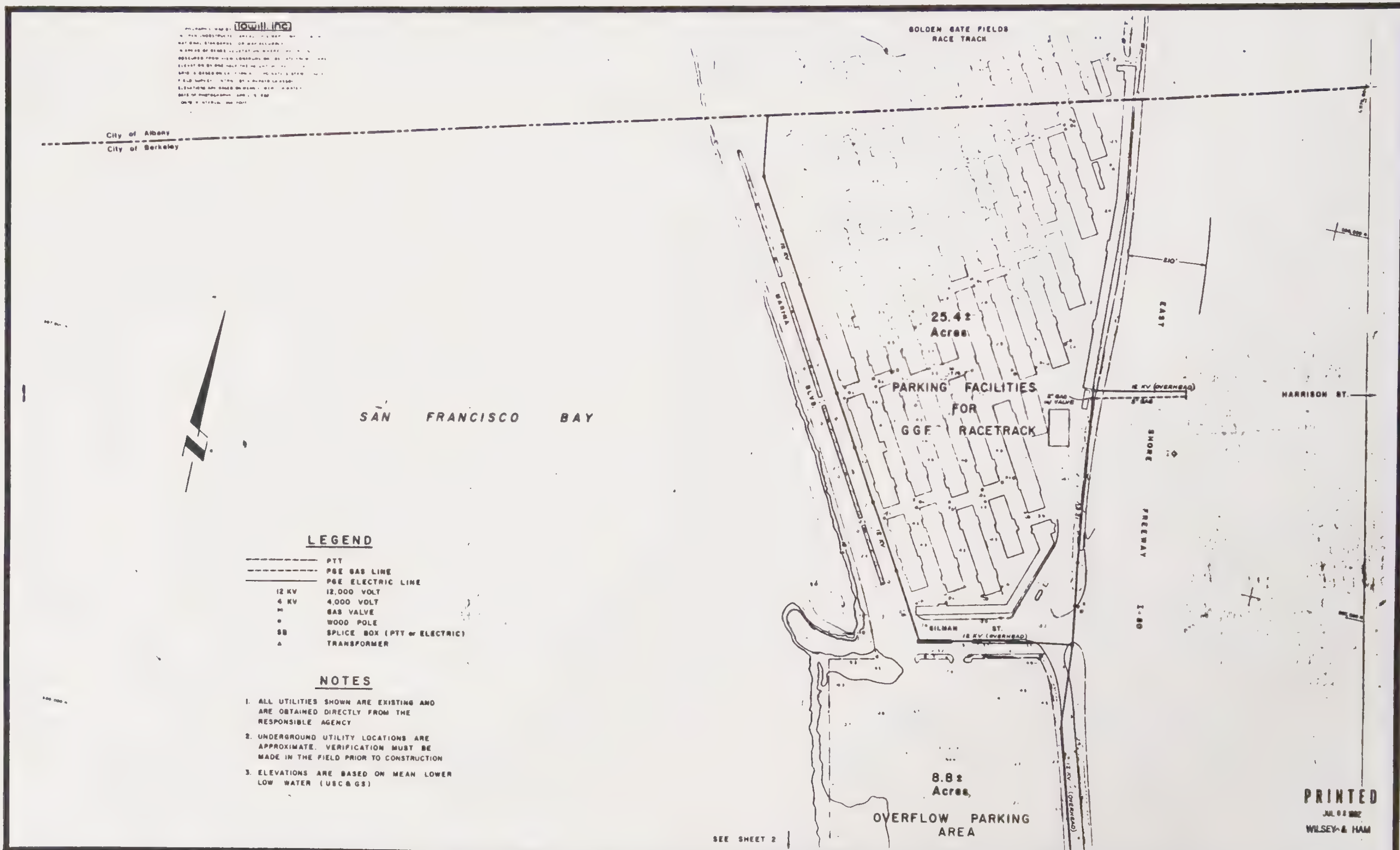
WILSEY & HAM

1035 EAST HILLSDALE BLVD FOSTER CITY, CA. 94404 (415) 349-2151

	BY	DATE
Fld Bk No		
Design		
Drawn		
Checked		
Chd/Const		
Proj Eng		
Div Eng		

PACIFIC TELEPHONE & TELEGRAPH AND PACIFIC GAS & ELECTRIC COMPANY UTILITY PLAN

SHEET 2 of 4
JOB NO: 143-0201
SCALE: 1" = 100'
DATE: 6/29/82



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PACIFIC TELEPHONE & TELEGRAPH AND PACIFIC GAS & ELECTRIC COMPANY UTILITY PLAN

SHEET 1 of 4
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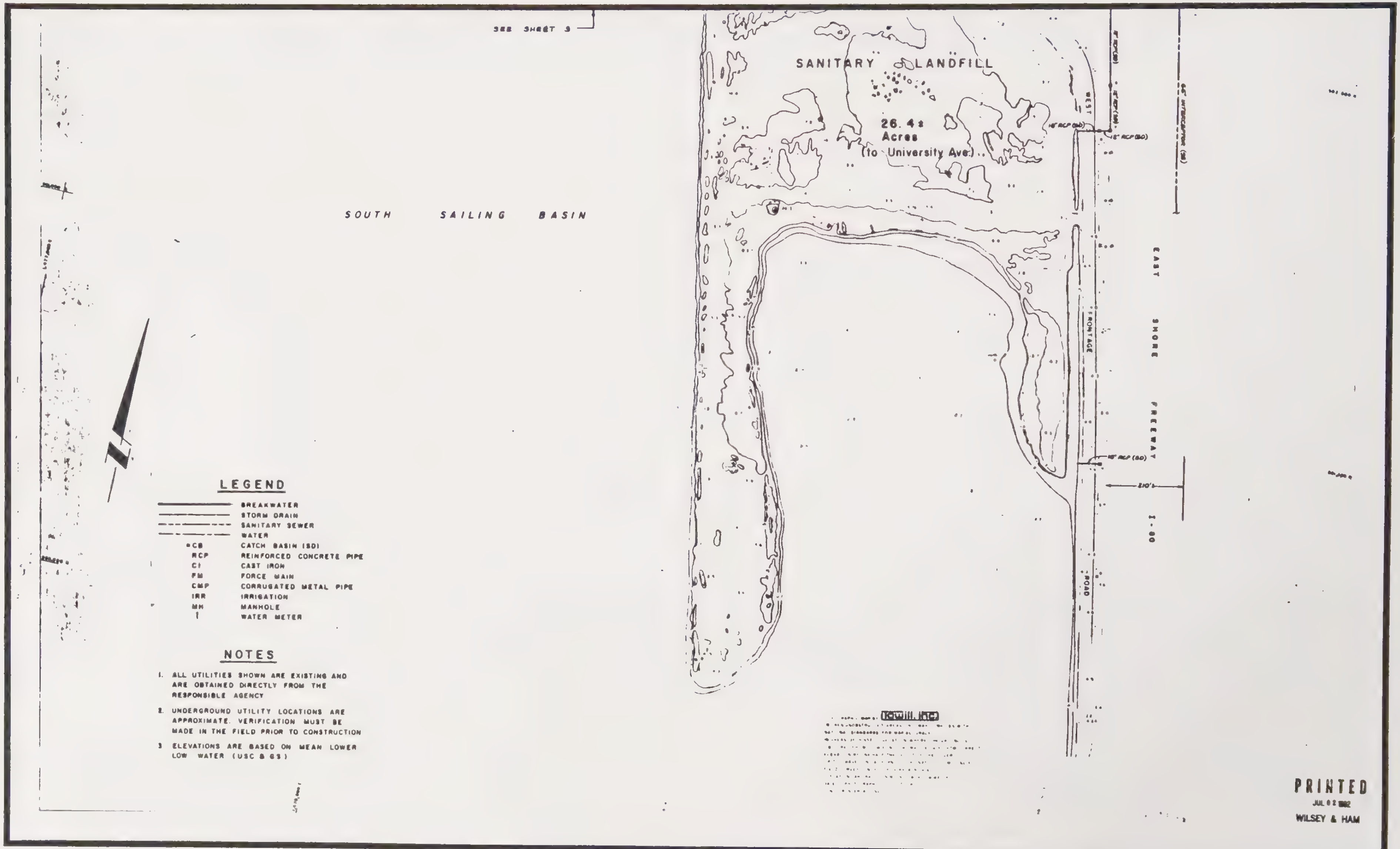

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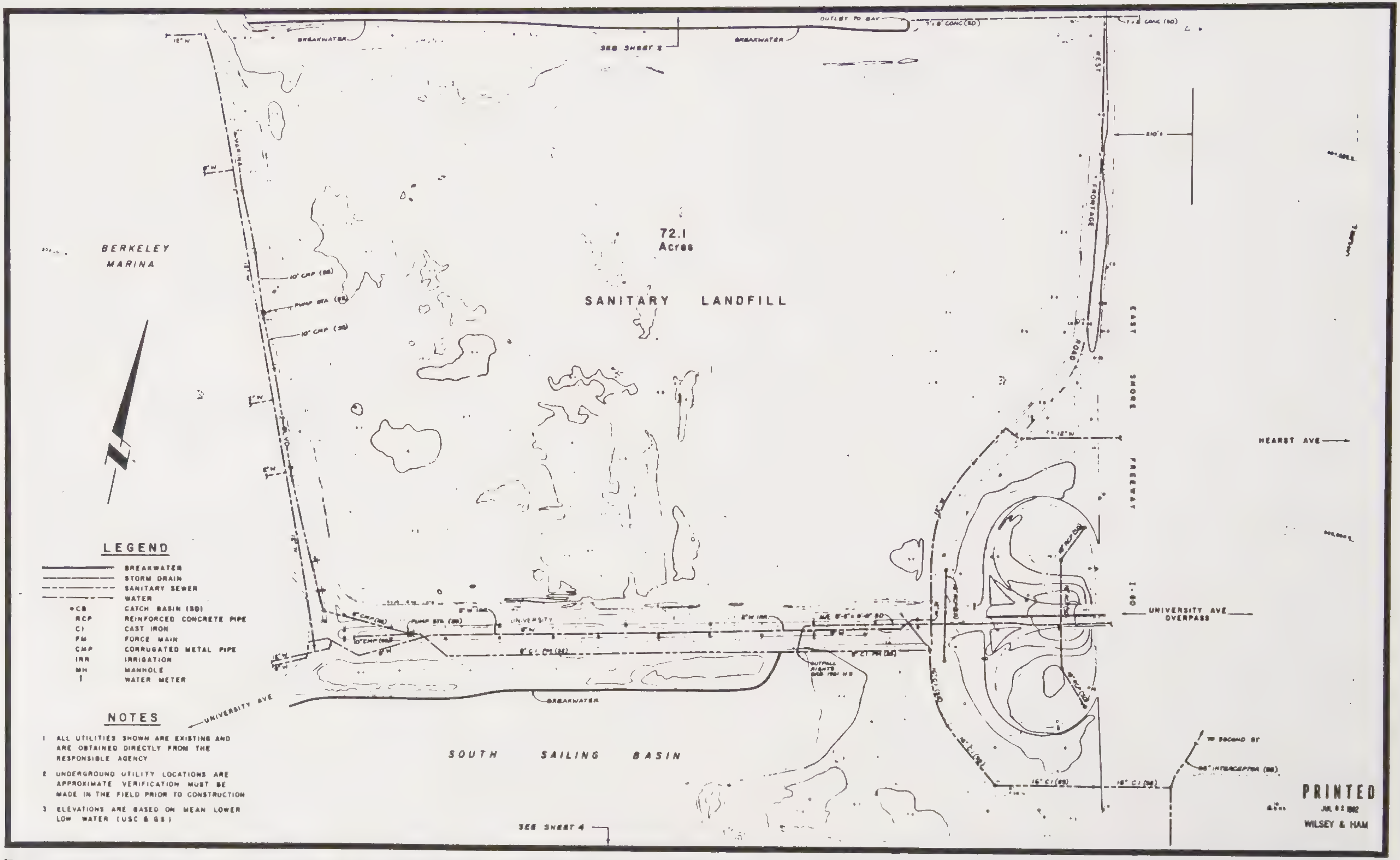
Proj Eng		
Div Eng		

WATER, SANITARY SEWER, & STORM DRAINAGE PLAN

SHEET 4 of 4
JOB NO: 143-0201
SCALE: 1" = 100'
DATE: 6/29/82



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WATER, SANITARY SEWER,
& STORM DRAINAGE PLAN

SHEET 3 of 4
JOB NO: 143-0201
SCALE: 1" = 100'
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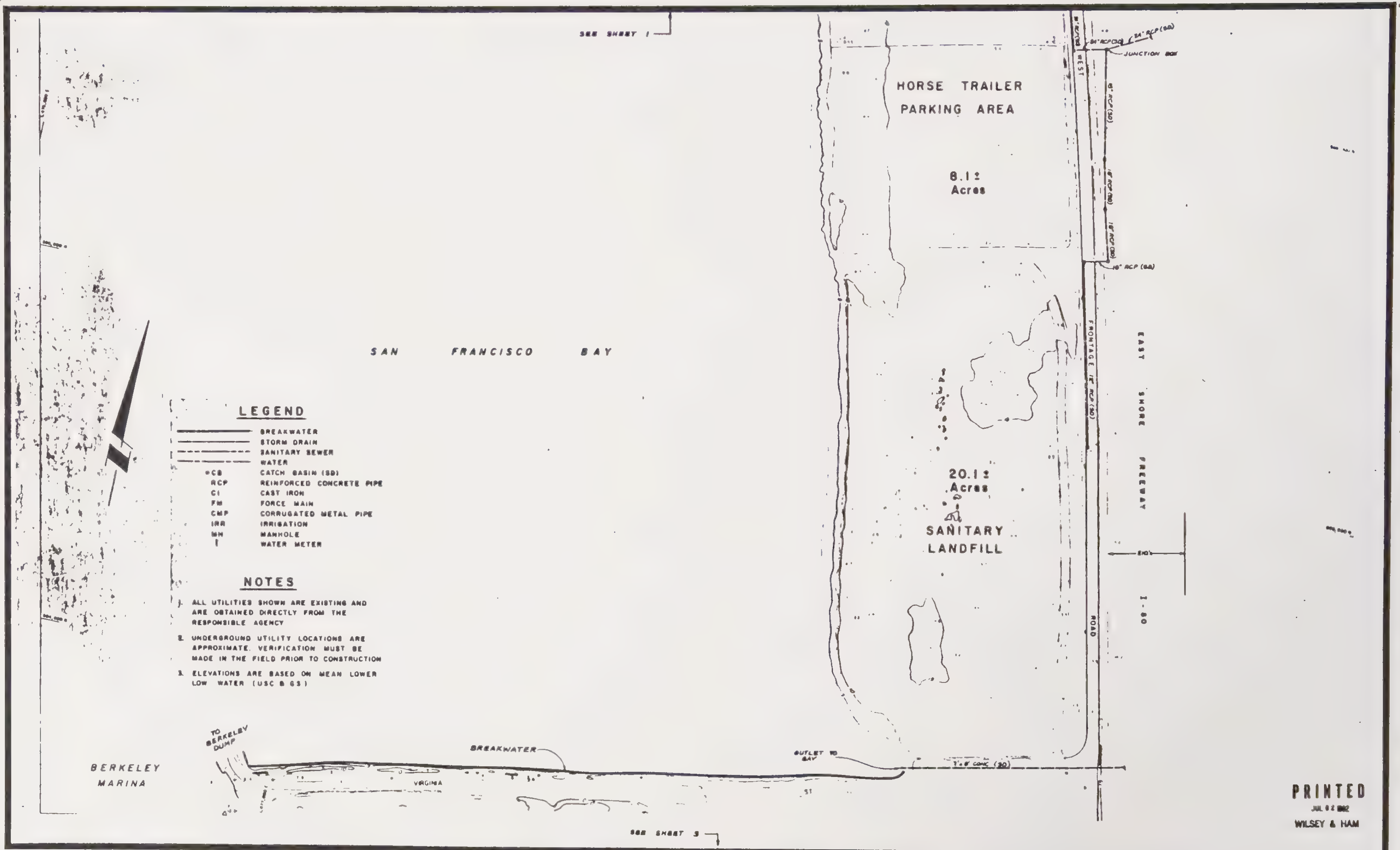

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WATER, SANITARY SEWER,
& STORM DRAINAGE PLAN

SHEET 2 of 4

JOB NO: 143-0201

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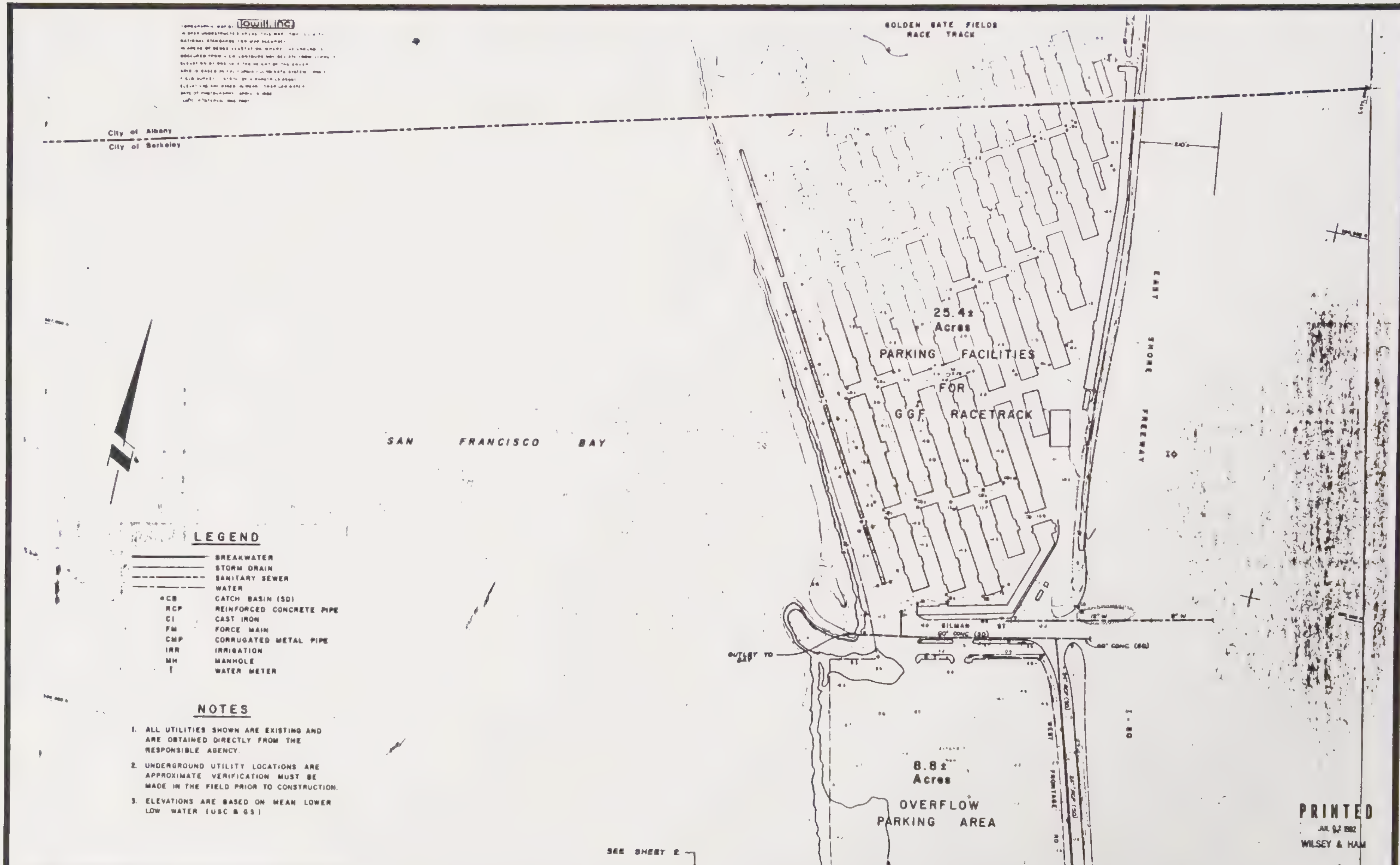

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WILSEY & HAM

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Proj Eng		
Div Eng		

WATER, SANITARY SEWER,
& STORM DRAINAGE PLAN

SHEET 1 of 4
JOB NO: 143-0201
SCALE: 1" = 100'
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Acoustical Analysis

charles m. salter associates inc.

architecture
engineering
the environment

2 July 1982

Bryan Grunwald
Hall Goodhue Haisley Barker
100 Stevenson Street
San Francisco, CA 94105

Subject: Berkeley Waterfront Constraint Analysis--
Acoustical Consulting

Dear Bryan:

We have completed our noise constraint analysis for the Berkeley Waterfront study area. We have performed on-site noise measurements and have used these measurements and anticipated year 2005 traffic volumes to derive on-site noise exposure contours for the year 2005. Based on this anticipated noise exposure, we have evaluated the site in terms of the Land Use Compatibility Standards contained in the Noise Element of the Berkeley General Plan.

Existing Setting

To quantify the existing noise environment in the study area, noise measurements were made on Wednesday and Thursday, June 9 and 10, 1982 at four locations. The measurement locations are shown on Figure 1. The results of the noise measurements are included in Table 1. Not surprisingly, Interstate 80 traffic is the major noise source in the study area. One interesting result of the noise measurements is that they show the importance of the predominant westerly wind on the site's noise environment. During times of relatively high westerly winds (>15 miles per hour), noise levels are 5-10 dBA* lower on the west side of Interstate 80 than on a calm day. Because these westerly winds occur with regularity in this part of Berkeley, they play an important role in determining the average noise exposure on the site. As an example of the reduction of noise levels during westerly wind

Charles M. Salter, PE
Eva Duesler
Thomas C. Hansen
Richard R. Illingworth, PE
Anthony P. Nash, PE

conditions, measurements that we have made along Interstate 80 in Emeryville on the east of the freeway under calm conditions indicate that at a distance 100 feet from the center of Highway 80, the equivalent noise level is typically an Leq** of about 79 dBA. At this same distance on the west side of the freeway at site 4, an equivalent noise level of 71 dBA was measured. Both of these measurements were made during free-flowing conditions, the only difference being the 20 mile per hour westerly wind.

Future On-Site Noise Exposure

Traffic noise levels in the area would be expected to increase by the year 2005 due to increased traffic volumes on Interstate 80, University Avenue and Marina Boulevard. Using the traffic projections prepared by Barton & Aschman Associates, we have calculated the anticipated increase in noise levels along each of these streets. The resulting on-site noise exposure contours (in terms of the day/night average noise level, Ldn***) are shown on the two enclosed 100 scale maps. The freeway noise exposure was calculated based on the assumption that on 50% of the days it is windy and on 50% of the days, it is not. The contours shown on the two attached maps cover only the proposed study area. The contours at the northerly portion of the site, however, could be extended through the expanded study area and would be accurate enough for the site constraint analysis.

Noise Constraints in the Berkeley Waterfront Study Area

The City of Berkeley has adopted quantitative guidelines for assessing the compatibility of various land uses with a wide range of noise environments. These guidelines are reproduced here as Figure 2. The guidelines are used to determine the level of mitigation that would be required to produce an appropriate interior noise environment for the proposed use. In addition to the guidelines, Title 25 of the California Government Code requires that interior noise level in new multi-family dwellings including new motels and hotels not exceed a day/night noise level of 45 dB. This standard will have ramifications in siting residential uses.

The noise exposure on the Berkeley Waterfront site would range from an Ldn of less than 60 dB farthest from Interstate 80 to an Ldn of greater than 75 dB adjacent to the freeway. In general, the development of uses exposed to an Ldn of greater than 75 dB should be discouraged. On the waterfront site, this would apply to development within 100 feet of the freeway right-of-way fence. It would be possible to develop industrial-type uses in this area

without extensive noise control considerations but other uses such as office development would require a high degree of acoustical isolation to provide an adequate working environment. In the area between the 70 Ldn and 75 Ldn contours, office, commercial, and professional uses could be located. In general, these buildings would require fixed glazing facing the freeway and mechanical ventilation. Depending on the proximity to the freeway, acoustically-rated glazing could be required. Housing is a possibility in this area although meeting the State requirements for interior noise levels would require sound-rated double-glazed windows in rooms facing the freeway and mechanical ventilation. Decks on residential units in this area should not face the freeway as it would be impossible to carry on a conversation on these decks. The area between the 60 and 70 CNEL contours is potentially developable with any of the uses likely to be proposed for this site. The most sensitive of these would probably be the residential uses. Residential development located in this area would require closed windows to meet the interior noise requirement and therefore would have to be mechanically ventilated. However, the requirements for the treatment of the building facade would range from nothing more than standard windows to sound-rated windows in low air infiltration rate frames. Office and professional uses would also require some degree of noise control depending upon the actual office use and its proximity to the freeway. Uses located outside of the 60 Ldn contour including residential units would require no specific noise control measures and would therefore be compatible with the future noise environment with no special treatment.

An effective noise control technique that could be used on this site would be to construct tall buildings between any residential development and the freeway. The presence of these buildings would reduce the noise exposure behind them and therefore the requirement for further treatment to the residential structures. The degree of shielding provided by these buildings would depend on their height and the spacing between buildings.

I trust that this information will be useful at this stage.

Sincerely yours,

Richard R. Illingworth, PE

RRI/esd
82-111

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*dBA--or A-weighted sound pressure level expressed in decibels, representing the loudness of a sound on a scale which corresponds to human hearing. A 10-dB increase in noise level is perceived to be twice as loud.
**Leq--the equivalent steady-state sound level that, in a stated period of time, would contain the same acoustic energy as the time-varying sound level during the same time period.
***Ldn--A descriptor established by the U.S. Environmental Protection Agency to describe the average day/night level with a weighting applied to noise occurring during the nighttime hours (10 pm - 7 am) to account for the increased sensitivity of people during sleeping hours.